Ministry of Agriculture, Fisheries and Food
Welsh Office, Agriculture Department
Department of Agriculture and Fisheries for Scotland

Assessment of the genetic quality of cattle for use in artificial insemination in Great Britain

Committee on the Artificial Insemination of Cattle

Report to the Agriculture Ministers

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First published 1984

ISBN 0 11 242650 6

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PART I

Introduction

BACKGROUND

1. In 1978 the Agriculture Ministers in Great Britain announced their intention to set up a committee under the chairmanship of Sir Richard Trehane to consider and advise on a number of issues relating to the artificial insemination of cattle. Membership was to be drawn from organisations within Great Britain with a known interest in cattle breeding. The Secretariat was to be provided by the Agriculture Departments who would also make available any additional support or expertise required.

TERMS OF REFERENCE

2. The terms of reference of the Committee were:

(a) to develop a comprehensive standardised system of information on both production and conformation features of the progeny of dairy breed bulls and an appropriate system of presentation of information suitable for beef breed bulls;

(b) to monitor the effects of the recently introduced arrangements (in 1977) for approval of young and mature dairy breed bulls;

(c) to suggest possible means of improving facilities for progeny testing young bulls including milk recording;

(d)* to consider how participation by the industry in bull approvals can best be achieved for the longer term.

PROGRESS REPORTS

3. We held our first meeting in April 1979 and submitted a progress report to Ministers following the fifth meeting in 1980. This interim report was accepted by

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* This last term of reference was added by Ministers in 1980.

Ministers who agreed with the advice of the chairman that, as our consideration of most of the issues referred to was not complete, the contents should only be disseminated amongst those bodies represented on the Committee.

4. We submitted a second progress report to Ministers in January 1983 following our eleventh meeting. This described the outcome of the further discussions that had taken place since the previous report in November 1980 and included the results of an initial consideration of the effectiveness of controls on the advertising of semen embodied in The Artificial Insemination of Cattle (England and Wales) Regulations 1980 and the comparable regulations in force in Scotland. We had sought and obtained permission from Ministers to discuss this latter issue at our meeting held in September 1982 in order that we might be able to report more fully in respect of our original terms of reference. Owing to the need to complete our consideration of a number of the issues referred to in the second progress report, Ministers accepted our advice that dissemination of its contents should be on the same basis as before.

FINAL REPORT

5. This is our final report. In it we document the outcome of discussions held in full committee on the twelve occasions we have met between our inception in 1978 and the expiry of our term of office in December 1983.

PART II

Standardised Information Systems

GENERAL

6. One of the first tasks we undertook was to study and assess the existing systems for gathering and evaluating information on the various traits of dairy and beef cattle in Great Britain that are considered important in breeding. The aim was to check on the degree to which information on the same trait gathered from different sources could be compared and the genetic merit of a bull thereby assessed. Where it was apparent that such comparisons could not be easily or satisfactorily made we sought to identify those factors important to the setting up of a standardised information system to enable such problems to be overcome.

7. We decided from the beginning that the traits most worthy of investigation were those put forward in 1977 by the Working Group of the European Association for Animal Production in their Code of Practice[1]. These were:

(a) milk yield and quality
(b) liveweight gain
(c) conformation
(d) temperament
(e) ease of milking
(f) ease of calving (incidence of dystocia)
(g) feed efficiency
(h) fertility
(i) disease resistance
(j) genetic defects.

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[1] Caillard C, Dommerholt J, Frimland E, Gjøl-Christensen L, Lederer J, McClintock A E, Mocquat J C and Phillipsson J: A I Bull Evaluation Standard for Dairy and Dual Purpose Breeds. *Livestock Prod. Sci. 4,* 115–128.

PRODUCTION TRAITS IN DAIRY BREEDS

Milk yield and quality

IMPROVED CONTEMPORARY COMPARISONS

8. We have reviewed the various systems employed in different countries for evaluating the breeding value or genetic merit of dairy bulls in terms of their milk yield and quality and concluded that the procedure used by breeders in Great Britain is the same in principle as those used in other countries with advanced dairy industries such as the USA, Canada and New Zealand.

9. In Britain all bulls within a breed whose progeny have been officially milk recorded may be directly compared because their estimated genetic merit obtained through the evaluation procedure is related to the same base-line; this procedure is known as the Improved Contemporary Comparison (ICC) (see Appendix A). This system provides the best available estimate of the bull's ability to transmit milking traits to his progeny and thus is the measure of one half of the breeding value of the sire.

10. A bull's genetic merit is published in terms of its ICC for:

kg of milk
kg of fat
kg of protein
percentage of butterfat
percentage of protein

any or all of these
may be above (+) or
below (–) a fixed base

The figures provide the best available estimate of the average merit of the future daughters of that bull compared with the daughters of a bull with a zero ICC for each of the traits listed above.

11. However, the reliability of the ICC proof of any particular bull will depend on the 'weighting' of the proof – a proof based on a small number of daughters and contemporaries being less reliable than one based on a large number of daughters and contemporaries. Possible bias in a proof resulting from, amongst other things, preferential treatment of progeny compared with contemporaries can be reduced by testing the bull in a larger number of herds. This is termed the 'spread' of the proof. A published bull proof gives the percentage of daughters in each of the two largest daughter groups and the number of herds in which daughters were recorded (up to a maximum of 150 herds).

ENHANCEMENT OF THE INFORMATION PROVIDED BY THE IMPROVED CONTEMPORARY COMPARISONS

Changes to the base-lines for improved contemporary comparisons

12. In order to be of most use as a measure of genetic merit in terms of milk yield and quality, the fixed base against which all measurements forming the ICC are made should be updated from time to time so as to keep pace with developments in the genetic merit of the breed concerned. It is important however that where

changes are made the size and reasons for these are well understood by the users of ICC data.

13. We have been informed that heifers from limited use Friesian/Holstein bulls born between 1968–1974 averaged 2.5 kilos more butterfat and 1.2 kilos more protein than those from limited use bulls born between 1962–1967, the base-line used at present. Bulls of other breeds born between 1968–1976 showed smaller changes and one showed a decline compared with the bulls born between 1962–1967 in these breeds and which are the base-lines for them. The 2.5 kilos may be taken as a measure of change in the population forming the base for the Friesian/Holstein breed. Whilst it is possible to change the base for one breed without changing the others there may be a case for changing all at the same time when sufficient improvement has occurred. We have considered this but decided that there is a case for updating the ICC base for the Friesian/Holstein breed alone from the beginning of 1985.

Inclusion of information on the interval between calving and conception

14. The interval between calving and the next conception is known as 'days open'. We have considered the possibility of including the effects of days open in the ICC procedure in terms of its effect on milk yield and quality but have concluded that although this would be useful it cannot be done at the present time. We have reached this view because of the practical problems involved in encouraging farmers to collect accurate and regular data on the service interval, that is the date of the first successful service after the previous calving, and the unacceptable delay of as much as twelve months in calculating ICCs that would result from having to verify the service interval.

Inclusion of information from second and third lactations of daughters

15. Some breeders hold the view that the inclusion of information from second and third lactations in the ICC calculations would increase the reliability of this estimate of genetic merit. They base this conclusion on the belief that some bulls produce daughters which do not reach their prime until the second or third lactations and are therefore undervalued by a system which relies on the results of first lactations only. However, the evidence suggests that the number of bulls likely to be so undervalued might be fewer than is sometimes claimed. Nevertheless, research sponsored by the Milk Marketing Board (MMB) at the University of Edinburgh[2] has been carried out in order to quantify statistically the advantages of including second and third lactation information. We have considered the results of this and conclude that the small advantages achievable in terms of greater accuracy of proof are unlikely to offset the increased cost of the computation and the greater time lag between testing a bull and the publication of the proof.

Expression of the distribution of daughters between herds in terms of a weighting in each herd

16. At present the distribution between herds of daughters of a test bull is expressed in terms of:

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[2] Meyer K: Scope for evaluating dairy sires using first and second lactation records. *Livestock Prod. Sci. 10,* 531–554.

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(i) the number and percentage of daughters present in the two herds which have contributed the largest number of records to the proof;

(ii) the number of daughters in each of the other herds, up to a maximum of 150 herds. A proposal has been made that the spread of daughters should be expressed as a weighting for each herd as this could provide more useful information than the present system. We have considered this very carefully but decided that in certain circumstances the distribution of the number of daughters can be a more useful guide to the likelihood of bias than the distribution of weightings. In addition the work required to effect the change proposed would be likely to give rise to prohibitive costs. Therefore we **recommend** that the present procedure be maintained.

CONCLUSIONS

17. We have considered the value of the information provided by the ICCs and concluded that this represents the most comprehensive measure of genetic merit in terms of milk yield and quality available at present. We therefore believe that a satisfactory standardised information system on the productive merits of dairy bulls in this respect already exists. However, we **recommend** that the ICC base-line for the Friesian/Holstein breed be increased from the beginning of 1985 and that the new datum be set in the light of the latest available evidence. We also **recommend** that the base-line for all breeds be kept under review and updated whenever sufficient genetic change has taken place to make it appropriate to do so.

Conformation

18. We have given careful consideration to the various systems of conformation or type assessment of dairy cattle practised in Great Britain. Although there are a number of these operated by both breed societies and the AI organisations they are, with certain notable exceptions, mainly run on similar lines. Such differences between the systems as do exist have arisen because the breed society schemes were developed to meet the needs of pedigree breeders primarily in relation to females, whereas members of the AI organisations are concerned more with sire evaluation and use conformation assessment to describe the average merit of the progeny of a bull.

19. We have concluded from a study of the current assessment methods and systems of data aggregation that it would not be easy to obtain agreement to the setting up of a standardised information system for conformation assessment. We have come to this view for three main reasons. These are, the costs involved in setting up and running a new organisation charged with the task of making the assessments, doubts over whether breeders would support an independent system in place of one run by breed societies, and the reluctance of AI organisations to rely on assessments made by another body. As an alternative we have considered the retention of the present arrangements but allied with the development of a procedure aimed at either combining all the information from

each into a single set of figures for each female or providing a basis for comparison of the separate results.

20. To investigate the feasibility of such a scheme we decided to carry out a conformation assessment trial using representative classifiers from four organisations. Four classifiers from each of the following organisations, namely Associated Artificial Insemination Centres (AAIC), British Friesian Cattle Society (BFCS), British Holstein Society (BHS) and MMB, visited two pedigree British Friesian, two pedigree British Holstein and two dairy progeny-testing scheme type farms and assessed the same 30 or so first calf heifers at each farm. Each organisation used its own routine assessment methods and scoring system. The data were then analysed by Dr W G Hill of the Institute of Animal Genetics, University of Edinburgh to ascertain whether there was any comparability between the assessments by the different organisations and hence whether it would be possible to combine the data from each organisation into a single score for each trait and thus provide a comparative ranking of the bull's transmitting abilities regardless of which organisation carried out the progeny assessment.

21. We received excellent co-operation towards monitoring the trial from the six breeders involved. Although there was some evidence that cows were ranked differently for certain features by different organisations the extent was insufficient to cause concern or problems and could be disregarded for the purposes of the objective.

22. The major conclusion from the trial was that there was no technical problem which would prevent the combination of information from AAIC, BFCS and MMB into a single score although there was some need for greater uniformity of standards and techniques. Inclusion of data from the BHS would however require agreement on the traits to be assessed and the standards to be used because the descriptive traits in that system were not comparable with those used by the other three organisations. However, all systems have one thing in common and that is the use of the Best Linear Unbiased Prediction (BLUP) procedure for aggregating the conformation assessments on a comparative basis.

23. Recently our attention has been drawn to the development of a new approach to the assessment of conformation. This is being called the Linear Type Assessment Method. It consists of assessing each of sixteen characteristics of the female on a scale of 1 to 9. It is intended to give a reasonably accurate description of the whole range of body types as opposed to a subjective assessment of merit based on a comparison with the current concept of perfection for each trait. A breeder can then decide for himself which characteristics are important to him and which progeny possess them. We understand that a number of breed societies are now adopting this new system together with the MMB, the Scottish Milk Marketing Board (SMMB) and those AI organisations associated with the Joint Friesian Progeny Testing Scheme.

24. Unfortunately however we do not foresee the BHS agreeing to any change in their method of conformation assessment at this time and so, notwithstanding the progress made with the introduction of the Linear Type Assessment Method, our goal of achieving uniformity of results throughout the industry or the development of an agreed system of comparison does not appear to be attainable at present.

Temperament

25. As a part of our consideration of the assessment of temperament we have examined the ways in which this is done in Germany, The Netherlands and Israel as well as in this country. We have concluded that the assessment of temperament is a matter of subjective judgement and can only be useful in identifying the small number of problem bulls. The present system of assessing the temperament of daughters during progeny inspections together with information on what proportion of daughters complete the first lactation, we believe, provides sufficient data on this characteristic to enable a decision to be taken as to whether a bull should be approved on grounds of temperament for further use in AI.

Ease of milking

26. Ease of milking is determined at present by subjective assessment of a bull's daughters. We believe that this, coupled with the practice of culling slow milking daughters, which reduces the weighting of the bull's ICC figures, adequately allows for this trait.

Ease of calving

27. We have reviewed ease of calving and concluded that evaluation of this trait plays an essential part in the assessment of bulls for AI. However, there is a considerable divergence of opinion among us as to whether there is in practice any problem in identifying a bull with a poor record in this respect. Some members felt that a bull with a bad reputation quickly became known. In addition, there is potentially a problem associated with gathering reliable ease of calving information in respect of young dairy bulls. In most cases such bulls undergoing progeny testing are used on a relatively small number of mature cows and although it is possible to collect ease of calving information it would be unreliable to use it in order to predict the incidence of dystocia which might arise when a particular bull is mated to heifers. It is the incidence expected in this latter age group which is of most concern to farmers.

28. It rapidly became clear to us in considering this topic that costs would preclude the use of milk-recorded cows to collect ease of calving information; the procedure favoured in some European countries. We considered, but rejected on time and cost grounds, the setting up of a scheme in which adequate numbers of heifers would be mated to selected proven bulls upon return to the stud following their first progeny tests. Neither, because of the time-scale involved, and the small number of daughters in a bull's initial progeny test, were we able to recommend that the progeny testing of a dairy bull should include an assessment of the ease of calving of his daughters.

29. We have therefore decided to **recommend** that AI centres and owners of bull studs should collect information on ease of calving from whatever source seems most appropriate to them but that this should be used to warn customers against the use of a particular bull on heifers rather than to recommend a bull in this respect.

Feed efficiency

30. We have considered the usefulness of measuring feed efficiency but concluded that although it is important, such information cannot be gathered under normal farm conditions. Furthermore, the high cost of making such assessments on sufficient progeny of a bull at testing stations prevents us from making any recommendations in this respect which would be cost effective. There is, however, a genetic relationship between yield and feed efficiency and we believe that reliance on this association is the only practical, albeit indirect, way of measuring and improving feed efficiency.

Fertility

31. We have considered the desirability of collecting and publishing information on female fertility but have concluded that this would be impractical owing to the magnitude of the task.

32. As for male fertility, it is obviously most important that semen should be able to fulfil its prime function, that of bringing about conception in the female. Before freezing, semen is evaluated in ways which are intended to give a measure of fertilising ability but the only certain test is when it is used on the cow. However, the fact that a cow does not conceive to an insemination is not necessarily the fault of the bull as other factors can play a part such as the fertility of the female and the skill of the herdsman and the inseminator.

33. Any assessment of the fertility of a bull requires that it is used on a relatively large number of females. In arriving at a workable scheme for assessing the fertility of bulls we considered that four aspects in particular needed to be studied. These were:

(a) the likely range of fertility of bulls;
(b) the appropriate number of inseminations on which to make assessments;
(c) the costs of monitoring all bulls used in AI;
(d) changes in a bull's fertility over time.

34. Evidence presented to us on the level of demand for repeat inseminations on the same cows by MMB and non-MMB bulls which had carried out a minimum of 1,000 first inseminations in MMB centre areas in the previous six month period showed that few bulls had a non-return rate of greater than 5% below average. This may well be attributable to the rigorous standards applied by AI centres when evaluating semen prior to freezing. We have therefore concluded that a 5% below average return rate provides a suitably stringent demarcation point and that bulls that attain a rate better than this should be considered of acceptable fertility. Those falling between 5% and 7.5% should be designated of moderate fertility and those below 7.5% of low fertility.

35. However, a considerable number of bulls are not used to the extent described above, but lowering the number of inseminations against which the judgement is made might lead to more bulls being classed of moderate or low fertility on the strength of less reliable data. In other words there would be much greater chance of a bull being classed as 'low' unfairly, as his apparent poor performance might well be explained by other factors than his own fertility. We have therefore

concluded that a bull should have given a minimum of 1,000 inseminations in a six-month period before any assessment of fertility is made.

36. A study carried out by the MMB's Computer Planning Department showed that the probable cost of collating and analysing non-return data would be between £35–40,000 for the programme and £1,500 for the running costs each time a printout was required (1983 prices). These costs do not, however, include those incurred by a number of the AI centres who would have to set up data collection systems for the large number of bulls used in their areas but which are privately owned and on which they do not therefore collect information at present. We consider therefore that it would be unnecessarily expensive to set up a system to record information on every privately-owned bull available through AI as many will be used to only a limited extent and would not in any case provide reliable data.

37. In view of all the difficulties and costs that would clearly be associated with the running of a comprehensive scheme aimed at assessing bull fertility we decided to test out the feasibility of establishing a limited scheme based on information compiled from the use of all bulls in MMB areas which achieved more than 1,000 inseminations in a six month period.

38. A trial of this scheme was carried out for the two six month periods April-September 1982 and September 1982-March 1983. In all, 303 bulls which met the 1,000 first insemination criteria were assessed and only 5 were found to fall in the moderate fertility category and 1 in the low fertility category. In the case of those bulls of the 6 which were privately owned, additional data from Reading and Dartington Hall Cattle Breeding Centres were included where available. This did not, however, modify the outcome to any significant extent.

39. We are therefore reassured to find that with very few exceptions the bulls used in AI are of an acceptable level of fertility. We **recommend** however that the scheme should continue in respect of high use bulls (more than 1,000 inseminations in a six month period). All qualifying bulls owned by AI organisations should be assessed on the basis of inseminations carried out within their own areas but privately owned bulls should be assessed on the basis of inseminations carried out in MMB areas only (the MMB AI service covers approximately 80% of cows in the country). We also **recommend** that owners of those bulls which fall into the moderate or low fertility categories be informed and made responsible for publicising the findings to potential semen purchasers.

Disease resistance

40. We have considered the possibility of establishing a standard approach to the assessment of disease resistance in cattle but have concluded that although desirable it is probably not achievable from a practical point of view at this time.

Genetic defects

41. The owner of a bull approved for use in AI (or the owner of semen collected from such a bull) already has a statutory duty to report the occurrence of

abnormalities in its progeny to the appropriate Minister and if so directed to any person possessing semen from that bull. We consider however that the standard and quality of the reporting of defects is poor and that farmers should be urged to improve on this. We therefore **recommend** that reporting be encouraged and that the information so gained be used to prevent an increase in the proportion of abnormal calves born. This could be done by limiting the use of an established bull or by taking information on ancestors into account when assessing the pedigree of a young bull proposed for testing.

PRODUCTION TRAITS IN BEEF BREEDS

Liveweight gain

42. We have established that:

(a) estimates of the genetic merit of beef bulls based on their growth performance are available from two sources as follows:

  (i) over 6,000 bulls are weighed annually on farms and produce 400 and/or 500 day weight results. Such information may be compared with breed averages or, preferably, with herd averages, but in most breeds the average herd size is small and there are few true contemporaries;

  (ii) more accurate estimates of genetic merit are possible when bulls are performance tested at central stations and around 500 bulls are tested in this way by the Meat and Livestock Commission. As well as growth, feed efficiency and withers height are measured and subcutaneous backfat thickness is estimated ultrasonically;

(b) some breeders have recently adopted some of the procedures of central tests in on-farm tests, though individual feed intakes are not recorded;

(c) estimates of genetic merit based on tests of progeny are also available.

  (i) On average some 35 bulls are progeny tested each year by members of the AI organisations. Records are obtained of ease of calving of their mates, for their progeny, daily liveweight gain, slaughter, carcase weight gain per day and carcase classification. Selection of the best bulls is made for widespread use in AI.

  (ii) A further 25–30 bulls of various breeds are tested each year in Young Bull Proving Schemes operated jointly by the Meat and Livestock Commission and breed societies. These schemes relate to breed improvement but limited use is made of the superior bulls, through AI, for either pure or cross breeding.

43. It appears to us that each member of the AI Organisation publishes information on the merit of beef bulls separately and in different ways depending on what information is available to them. The MMB publishes the progeny test results in a consistent way but there is considerably less uniformity amongst the Associated AI Centres in the quantity and quality of this information that they produce. We therefore **recommend** that a uniform system for publishing data on liveweight gain and other performance indicators be established as a Code of Practice. This would not only provide a better basis for a consumer to be able to

make an informed choice about the merits of the semen from a particular bull but would also enable Departments to have the fullest information available on performance when considering an animal for approval under the Regulations. A system which we feel would fulfil these requirements is given in Appendix B.

44. The use of the system for publishing data which we recommend will not, however, overcome all the difficulties associated with the testing of beef breed bulls. We consider that ideally bulls should be station-tested as comparative data on performance can be most readily obtained in this way. Unfortunately, however, we do not foresee a marked increase in the number of bulls performance tested centrally in order to meet this ideal. Thus a proportion of the AI demand must continue to come from bulls that are weight-recorded on the farm. As beef breed herds are, on average, small in number many of these bulls will not have any valid contemporary data and decisions on these cannot therefore be entirely objective. We are pleased to note, however, that as many as 50 herds are now beginning to run performance tests on-farm.

Conformation

45. We have considered the feasibility of establishing a standardised system for conformation assessments of all beef bulls. We have noted that such a system is used for the assessment of bulls at the end of performance tests carried out on-station but there seems little enthusiasm in the industry for extending this to include animals tested on-farm. Breeders appear to prefer to rely on personal assessment in order to evaluate such bulls. We have examined the situation in other countries including the USA and concluded that they do not operate any formally established systems. We have, therefore, decided that it would not be appropriate for us to make any specific recommendations on this matter.

Temperament

46. Given the subjective nature of the assessment of this trait (see paragraph 25) the fact that differences between breeds are far more obvious than within breeds and its lesser importance to breeders of beef cattle as opposed to dairy cattle, we have concluded that no recommendation by us is called for here.

Ease of calving

47. An assessment of ease of calving in respect of a beef bull offered for AI is of importance to farmers. However, not all AI centres collect and publish information on the ease of calving of the mates of such bulls but when this is done the information based on postal or oral reports from farmers is collected in a systematic way and published in the form of a percentage incidence of 'seriously difficult' calvings and calvings requiring veterinary assistance. Although there are no valid comparisons made between bulls in the different AI studs and only some between bulls assessed in different years we consider that the present system is adequate in respect of beef bulls and **recommend** its continuance and extension to all AI centres.

Feed efficiency

48. Beef breed bulls reared on testing stations do provide a means of measuring feed efficiency. However, as the majority of beef bulls offered for AI are reared on-farm, the conclusion we reached on this subject in respect of dairy cattle (paragraph 30) must be considered to apply here as well.

Fertility

49. We have discussed this matter in detail in paragraphs 31–39. The conclusions we have drawn and the recommendations we have made should be taken as encompassing bulls of beef breeds as well as of dairy breeds.

Disease resistance

50. See paragraph 40.

Genetic defects

51. See paragraph 41.

BEEF MERIT OF DAIRY BULLS

52. We have considered the case for dual testing of dairy bulls for both beef and milk production, that is, a performance test for beef characteristics prior to progeny tests for milk production traits. However, such a system could lead to some reduction in the progress for milk production traits and require a very considerable financial investment. We believe that dairy farmers would not support a scheme which led to less progress in dairy requirements despite the fact that dual testing would probably be beneficial nationally to the cattle industry as a whole. We feel, therefore, that we cannot recommend the use of dual testing for dairy bulls but we wish it to be noted that this system of testing is used successfully by some of the industry's potential competitors in other European countries.

53. The MMB have for some years been assessing the heifer progeny of Friesian/Holstein sires for beef shape. The Board has recently completed a trial aimed at assessing the extent to which the results of progeny tests for beef shape based on assessments of heifer progeny are reflected in the beef shape of male progeny. The results which have been published[3] show that the relationship is

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[3] Cook K N and Newton J: A trial to evaluate the Milk Marketing Board beef shape assessment scheme for Friesian/Holstein sires. *Anim. Prod.* (in the press).

sufficiently strong for breeders to be able to take account of this in sire selection if they wish. However, there are negative correlations between beef shape and ICCs for fat yield and protein yield so that selection for improved beef shape is likely, on average, to be associated with some sacrifice in terms of milk solids yield potential. We have noted these findings but feel that no recommendation in respect of them is required.

PART III

Assessment of the effects of changes made to the AI arrangements in Great Britain

GENERAL

54. We were asked under our second term of reference to "monitor the effects of the recently introduced arrangements for approval of young and mature dairy breed bulls". The arrangements in question were those embodied in The Artificial Insemination of Cattle (England and Wales) Regulations 1977 and the comparable ones in force in Scotland. However, before we came to start work on this aspect of our remit the Regulations were superseded by The Artificial Insemination of Cattle (England and Wales) Regulations 1980 (which came into force on 1st May 1980) and the comparable ones for Scotland. We have, therefore, concentrated on the arrangements contained in the latter Regulations in fulfilling our obligations under the original terms of reference.

THE CURRENT AI ARRANGEMENTS

55. A comparison of the use which could be made of AI bulls in Great Britain before and after the introduction of new AI arrangements on 1st May 1980 is included in Appendix C. All young pedigree bulls may now be progeny tested outside the owner's herd without restriction on the number of herds up to a limit of 500 straws. Previously bulls not meeting Departmental standards for progeny testing were restricted to distribution of 750 straws in not more than 10 herds (including the owner's).

56. The most significant change introduced for the mature bull is that when it achieves an ICC weighting of 5 a maximum of 3,500 straws inclusive of those already used for the progeny test is allowed regardless of its daughters' production and conformation standards. Previously, bulls could only be used when they had achieved a minimum ICC weighting of 10 and their daughters met Departmental standards for both production and conformation, and widespread use was only authorised at a weighting of 15. The new arrangements allow higher limits (up to 15,000 straws) than hitherto for bulls whose weighting is at least

10; unlimited use is granted when a weighting of 15 has been achieved and data for the bull's daughters are recorded in 7 or more herds.

57. Overall there has been a considerable measure of relaxation of control; any young bull may now be progeny tested in AI without herd restrictions and all bulls can qualify for some use in AI. It is only the extent of the use permitted which will vary according to weighting, production and conformation qualifications and spread of daughters. In addition to these new arrangements a significant change has been introduced in the rules for unlimited own-herd use of bulls. Previously such use in AI was confined to the herd or herds where the pattern of ownership of the bull and the cows was the same. Under the new arrangements, regardless of whether a bull qualifies for one of the distribution limits for use outside the owner's herd, unlimited distribution of semen is now permitted within the herds of up to the first six co-owners of a bull.

THE ASSESSMENT OF EFFECTS ON GENETIC QUALITY

58. In considering how to assess the effects of the recently introduced arrangements we decided it would be most appropriate to concentrate on the effects the changes would have on the genetic potential for milk production in the National Herd. We therefore reviewed the comparisons that might be possible, the reliability of the guidance each would provide and the need to establish appropriate base-lines for the comparisons.

59. We concluded from this that the two most important criteria were the comparison of the annual rate of genetic progress after May 1980 with that achieved in previous years, and the assessment of the contribution made by each of the new bull approval categories to the genetic merit of the average heifer, bred by AI, entering the National Herd. Both these comparisons could be made by retrospective or by predictive methods and we decided that both approaches should be used as far as possible.

60. We agreed that the relevant comparison for the annual rate of genetic change should be between the average of the first ICCs of annual groups of bulls approved after May 1980 and the average of the first ICCs of bulls in the preceding five years. The results from this would establish the trend of the ICCs over a period. The base-line of this trend would be provided by the average ICC data for bulls whose first ICC figures became available in each of the 5 years prior to May 1980.

61. However, we considered that as new, that is different, categories of bulls were being introduced in the new arrangements it would not be possible to make valid and effective comparisons of the contributions from each of the old categories of bulls with those from each of the new, although it would be possible to compare the overall effect of the old and new arrangements on the genetic merit of the average heifer entering the National Herd at a defined time. Furthermore, it would also be possible to calculate the contribution of each of the new categories of bulls to the overall average.

62. To enable the correct weight to be given to each bull's contribution to the genetic average of its approval category and its effect on the genetic contribution of each approval category to the overall effect on the National Herd we concluded that data would need to be collected on the annual semen usage, from May 1980, for all bulls except those approved only for use in the herd(s) of a sole owner.

63. However, detailed examination of the effort that would be demanded of both the AI organisations and the Agriculture Departments in realising this requirement showed that it could not be justified on cost grounds. We therefore reluctantly accepted that any monitoring of the effects of the new AI arrangements would have to be based on the information that was routinely available from the AI organisations.

64. In order to make best use of this data we decided that we should reappraise our objectives and define the minimum requirements necessary to fulfil our remit on monitoring. We agreed that these were:

(a) Comparisons of the annual trends of semen usage from the different designated categories of bulls under the AI arrangements which came into effect on 1st May 1980.

(b) Comparisons wherever possible of the trends of the average ICC data, when available, for
   (i) Grade A (Progeny Testing) bulls approved in successive years;
   (ii) Grade B (young) bulls (that is, under 3 years of age at the time of approval) approved in successive years;
   (iii) Grade A with Grade B (young) bulls;
   (iv) Grade B (older) bulls (that is, over 3 years of age at the time of first approval) approved in successive years;
   (v) Grade B (older) bulls with Grade A and with Grade B (young) bulls.

(c) Comparisons of the proportions of Grade A (Progeny Testing) and Grade B (young) bulls likely to attain a reasonably reliable proof when the bulls themselves were still comparatively young. These bulls could be expected to have the greatest time-span for use as mature animals.

65. However, we very soon discovered that even with these revised requirements there were still likely to be a number of problems in obtaining and processing the necessary data. These took the following form.

(a) Details of total semen usage from bulls were not available as the AI organisations only kept information on first inseminations, that is, the first time a heifer or cow was inseminated after the previous calving.

(b) Some AI centres do not record inseminations by all bulls individually. In general these are inseminations from bulls whose semen has been imported from another AI centre. Inseminations from such bulls are frequently recorded 'in bulk on a breed basis' and it would not be possible, without a change in the centre's recording system, to allocate individual bulls to their correct approval category.

(c) There is a considerable movement of semen to storage flasks on the farms of approved 'Do-It-Yourself' (DIY) AI users. There would appear, therefore, to be no mechanism for the collection of details of inseminations by individual bulls in DIY herds so that the contribution of individual bulls can be allocated to the correct AI approval category. In other words, although there are accurate data available on the amount of semen from individual bulls transferred to DIY flasks there are no data concerning the usage of that semen.

(d) The time-scale of a progeny test is such that a minimum period of 4 years, and more likely 6 years, must elapse from when a bull is used in AI (or natural service) before his daughters complete their first lactations and the data have been analysed and his ICC figures (the estimate of his transmitting ability for milk production traits) are available. Only then can decisions be made about his future approval and use. As it will be about 1986 before the first ICCs will be available from bulls approved in the first 'year' under the 1980 Regulations (that is, in the period 1st May 1980 to 31 March 1981), and as no annual trend will be discernible until at least five years of proofs have been examined, the full trend of effects of the AI arrangements would not be capable of being assessed until 1991 at the earliest.

(e) There was a possibility that the use made of Grade A (Progeny Testing) and Grade B (young) bulls would be such that relatively few would obtain reliable proofs when reasonably young. If this was indeed found to be the case it would further weaken the likelihood of being able to determine trends by 1991.

66. On examination of these potential diffficulties in more detail we decided that the problems described in paragraphs 65 (b) and (c) would probably have the most serious effect on the accuracy of any conclusions we might draw on the effectiveness of the arrangements introduced in the 1980 Regulations. We therefore sought to overcome these problems by applying a factor to all records of semen transferred between those AI centres who do not subsequently attribute its use to a particular bull and to all semen transferred to DIY flasks in all AI areas. In this way we were able to obtain an estimate of the likely 'first insemination' *use* of the semen from bulls that had been transferred between centres or provided for DIY purposes. The factor was calculated on an annual basis from MMB records as this organisation attributes all first inseminations carried out in its areas by its inseminator service to individual bulls, regardless of whether the semen originated from within the area or was imported from another area. The factor, which must always be less than one, is calculated from:

$$\frac{R_1}{R_2 - R_3}$$

where:

R_1 =the number of first inseminations in MMB areas from bulls whose semen was transferred in that year

R_2 =the total number of straws of semen from bulls transferred to MMB areas from non-MMB AI centres

R_3 =the number of straws of semen from the same bulls transferred to DIY flasks in MMB areas

67. During the life-time of this Committee we have been able to complete three full years of monitoring of bull approvals under the 1980 AI Regulations. The results of this work are contained in Appendix D to this Report.

68. Tables 1 to 5 show, by breed, the first inseminations by bulls approved in each of the monitoring years, that is, three years of monitoring of bulls approved in the first year of operation of the 1980 Regulations, two years of monitoring of Year 2 approved bulls and one year of monitoring for Year 3 bulls. These results confirm an early indication that the vast majority of inseminations are carried out with semen of Class I bulls, that is, those which by virtue of their proof are allowed unlimited distribution of their semen. Very little use is made of mature bulls other than those in Class I in the Friesian/Holstein breed but more use is made of such bulls in the less numerous breeds. We are nevertheless very reassured by these findings.

69. In order to study the speed of uptake of semen from young bulls, which in turn would indicate the likely time interval before an ICC proof becomes available, Table 6 has been calculated. The results relate to Year 1 bulls only and indicate first inseminations in each of the three years of monitoring. They demonstrate clearly the large difference between inseminations by Grade A (P/T) bulls and inseminations by Grade B (young) bulls over the three year period. This difference is especially marked in the less numerous breeds. The general trend seems to be for bulls to be most used in the second year (this is probably because the bulls would only be available for about six months, on average, of the first year). In Year 3, inseminations tend to fall off rapidly and it may be fair to assume that little semen is used from these bulls in the fourth and subsequent years. In any event, such semen could make little contribution to the early ICC proof of these bulls.

70. Obviously the scale of testing of young bulls is also of importance as it determines the number likely to attain a reliable proof while still reasonably young. As we discussed earlier this also affects the time scale within which it might be possible to determine trends in the genetic quality of the National Herd.

71. Therefore we have attempted to assess the scale of testing of the young bulls approved under the 1980 Regulations. The results of this are shown in diagrams 1 and 2 of Appendix D. Diagram 1 relates to Friesian/Holstein bulls only and diagram 2 relates to bulls of all other breeds. Diagram 1 shows that:

(i) 13.22% of Grade A and 32.7% of Grade B bulls had less than 50 straws of semen distributed in the three year period. This may have been because of problems with semen production or freezing, or simply that some of the bulls were unwanted.

(ii) Only 42.8% of the Grade A bulls and 8.5% of the Grade B bulls achieved a level of uptake of their semen within the three year period of 300 straws or better. We consider that is the minimum number of straws that should be used if a satisfactory proof is to be obtained. However, even if a level of 200 were to be considered acceptable as a minimum, around 27% of Grade A and 80% of Grade B would still be insufficiently used to ensure an adequate progeny test.

(iii) Only a very few bulls are used to the limit of their semen approval within a three-year period. This suggests to us that the limits for young bulls presently laid down are quite adequate for the purpose of achieving an effective progeny test.

CONCLUSIONS

72. We feel that the monitoring exercise conducted over the last three years has produced some useful results. It might be said that several of these merely support the views already held by many breeders as to the use of various classes of bull approved under the Regulations but the exercise should not be considered any less worthy for having confirmed that. We have found a number of the results to be broadly reassuring particularly in respect of the superior use made of Class I mature bulls and Grade A (Progeny Testing) young bulls over those of less, or likely to be of less, genetic merit. We are therefore satisfied that the general liberalisation of the Regulations introduced in 1980 over those in force earlier is unlikely to have led to a higher demand for semen from bulls of lower genetic merit.

73. However, because of the time-scales involved, we have not been able to make any assessment of the effects of the Regulations on the genetic quality of the National Herd. As we have discussed, such an assessment would be unlikely to be completed before about 1991. Nevertheless, we feel that an attempt should be made to complete this task, possibly by the Agriculture Departments, but in view of the increasing burden to all involved in adding more bulls to the assessment each year we **recommend** that the exercise should continue only in respect of those bulls already in the system.

PART IV

The improvement of facilities for progeny testing

GENERAL

74. We believe that progeny testing resources are used in the following three broad ways:

(a) Cows mated by natural service in breeders' herds.
(b) Cows inseminated with semen from privately owned bulls.
(c) Cows inseminated in the course of planned progeny test programmes operated by members of the AI organisations, breeders' groups and a very small number of individual breeders.

75. In considering this topic in detail we examined a large body of information submitted by various organisations represented among us. A digest of the information contained in these submissions is included in Appendix E to this Report. This covers the following aspects of the subject:

(a) The level of official recording (in 1980).
(b) The proportion of cows used for progeny testing in England and Wales and in Scotland.
(c) The ideal proportion of cows to be put to testing bulls.
(d) Should more bulls be tested and are more recorded cows needed to test them?
(e) Why farmers choose not to participate in progeny testing.
(f) The incentives required to provide more recorded cows.
(g) The causes of the loss of heifer records.

CONCLUSIONS

76. After careful consideration of all the various issues we have come to the following conclusions.

(a) Existing facilities appear to be adequate for the present and foreseeable size of testing programmes. There is therefore no clear case for extra incentives to be provided to increase the number of recorded cows from this point of view alone.

(b) Better use could be made of the presently available officially recorded cows in Great Britain. Evidence available from England and Wales, for example, shows that some 40% of official recorded heifer records do not contribute to sire evaluation and that 75% of this loss is due to the absence of positive identification, date of birth or identification of the heifer's sire and/or dam.

(c) If it is necessary in the future to increase the number of milk recorded cows available for progeny testing then this can be most effectively achieved through convincing herd owners of the value of recording as a management tool rather than as a means to participate in a testing scheme.

PART V

Participation of the cattle breeding industry in bull approvals

GENERAL

77. At the present time control over the use of all bulls offered for AI in Great Britain is exercised through the requirements of The Artificial Insemination (England and Wales) Regulations 1980 and the equivalent regulations operative in Scotland. These regulations impose veterinary health and livestock quality standards which bulls must meet if they are to be permitted for use in AI. They also impose standards on the advertising of semen. As a Committee we recognise without reservation the requirement for bulls to meet veterinary health standards but after a great deal of discussion we remain divided on the need for livestock quality controls and advertising standards to continue under the control of Government or indeed to continue at all. There are essentially two opposing points of view; one held by the breed societies (as represented by the National Cattle Breeders' Association) and the other by, primarily but not exclusively, the AI organisations and the farmers (as represented by the Farmers' Unions).

LIVESTOCK QUALITY CONTROLS

The breed societies' view

78. In arguing their case to us the National Cattle Breeders' Association (NCBA) sought to establish that livestock quality controls were unnecessary for all practical purposes related to the breeding of cattle. They felt that breeding is not an exact science and that selection aids must be allied to the experience of the breeders who need access to the widest possible choice of genetic material with bulls of both plus and minus ICC being freely available so that conformation can be suited to herd requirements. It was said that no evidence had been produced that livestock quality controls had in any way contributed to livestock improvement in Great Britain and use of a succession of plus bulls could have a long term detrimental effect on the national dairy herd. Countries that assist with

scientific aids to breeders but do not attempt to control breeding were said to have made the most genetic progress. Israel, Finland, Canada and America were quoted as examples.

79. The NCBA also maintained in their submission that the existence of livestock quality controls had not improved British cows and in fact the opposite had happened as there was a need to import to improve the genetic merit. Further, livestock quality controls restricted the import of semen from bulls proven abroad and it was felt that a more effective method of keeping out low quality semen would be to obtain the approval of breed societies before importation of semen was allowed.

The AI organisations' and farmers' view

80. The AI organisations and the Farmers' Unions felt that livestock quality standards were intended primarily to ensure that the genetic standard of the National Herd did not fall and to provide a measure of consumer protection. They stated that livestock quality controls did not prevent the distribution of 500 straws of semen from a pedigree bull, which was sufficient to allow a progeny test of adequate size. Thereafter a further 3,000 straws could be distributed from a bull, minus rated or otherwise, with no account being taken of conformation as long as it had ICC production information with a weighting of 5. An owner, and 5 other co-owners, also had unlimited use of semen of any bull, minus or otherwise, in their own herds. If a bull's progeny test information proved satisfactory more semen could then be sold to other herds until the bull's progeny test results were sufficiently good to meet Class I status when there would be no restrictions on sales of semen. Livestock quality controls did not therefore prevent semen from any bull being made available for use in AI, albeit to a limited extent in certain cases. Minus bulls could be used as it was recognised that they could breed some good animals although in the experience of the AI organisations the high ICC bulls were most in demand and the best information available suggested that the use of a minus production bull could seldom be justified.

81. On the subject of imports the AI organisations and the Farmers' Unions pointed out that the distribution of semen from a bull tested abroad and meeting Class 1 standards was subject to a limit of 7,500 doses. There was no livestock quality limit on the import and storage of semen as a commercial venture should the bull qualify in this country for a more widespread distribution of semen as a Class 3, 2 or 1 bull. Breed societies could limit the use of imported semen as far as herd book entry was concerned.

ADVERTISING CONTROLS

82. We were informed that the controls over advertising were introduced by the 1980 Regulations following the views expressed that any relaxation in semen

distribution limits should depend on the provision in advertisements of full and accurate information about the merits of bulls concerned and that such provision of information should be a statutory requirement. However, following representations from the industry that the interests of semen purchasers would be adequately protected if detailed requirements were to be required only for Unclassified and Grade B (Untested) bulls the Regulations were drafted accordingly with the proviso that for other bulls the vendor would be required to divulge full information if so requested in writing by the purchaser.

83. Our discussions on livestock quality controls highlighted the risks that lie in the use of bulls with initial proofs based on limited use and a narrow distribution of daughters. It was also suggested in discussion that there must be some doubt as to the effectiveness of the advertising controls when in practice the full requirements as set out in the Schedule to the Regulations apply to some 5% of the dairy breed semen used in this country.

84. It was put to us that what may be needed to help to overcome this situation is a requirement for information on the distribution of daughters between herds to be made known to potential purchasers. This would enable them to judge for themselves whether existing figures are based on sufficient evidence to justify the use of that bull's semen in their own herds. Other factors besides the spread of daughters that may need to be considered are the sizes and signs of the ICCs for milk yield and for fat and protein yields and percentages of fat and protein as well as how close the number of daughters contributing to the assessment is to the total in all herds.

85. In addition to these matters we also considered how significant a problem was posed by advertised bulls being unable to sustain their merits as portrayed in advertisements based on a limited number and spread of daughters and to what extent the problem was sufficient to call for either a revision of the existing advertising controls or the bull approval categories.

THE FUTURE OF LIVESTOCK QUALITY AND ADVERTISING STANDARDS

General considerations

86. In the light of our discussions on livestock quality and advertising controls we considered carefully what the future of these should be and the extent to which the cattle breeding industry as a whole should be involved.

87. The majority of us saw the main participation of the industry as being:
(a) full consultation between all sectors of the industry including the commercial sector; and
(b) co-operation between all bodies to educate breeders and 'commercial' farmers in the interpretation and use of scientific principles and aids to improvement providing recording and evaluation procedures.

88. Written representations made to us referred to the need to ensure that any future arrangements resulted in a competitive situation, the continued progeny testing of the most promising bulls, greater educational effort, standardised presentation of information, the freedom to decide on which bulls to use, the recognition of disease resistance and longevity in selection programmes and the recognition of the implications of relevant EEC legislation.

89. In our discussions divergent views were expressed. The NCBA representatives wished for reasonable veterinary controls to be continued and carried out by Agriculture Departments who would also be involved in an independent, advisory and consultative capacity to put the views of other sides of the industry (AI organisations and Farmers' Unions), but the breed societies would, as experts for their own breeds, decide which bulls were to be approved for widespread use in AI. Functional traits, breed characteristics and production/performance records would be taken into account in reaching their decision. They also hoped that it would be possible to standardise provisions between beef and dairy breeds.

90. Other members of the Committee were in general agreement that breed societies should be involved with other members of the industry in the principles of approval but considered that they should not be involved in individual approval decisions. Agriculture Departments were considered the appropriate authority to be empowered to make and enforce such decisions.

91. The need to maintain control of imports was generally recognised although it was also felt by one or two members that too much concern was being expressed on this point as no one would promote poor quality bulls.

92. Finally we agreed that the future controls on beef bulls for use in AI should be considered separately from those on dairy bulls.

Controls over beef breed bulls for use in AI

93. The NCBA made a submission to us on the future controls they considered should be operated in respect of beef breed bulls. This had the unqualified support of all the beef breed societies represented by the NCBA and contained four principal objectives. These were:

(i) Breed societies should be consulted for those bulls for which application had been submitted to the Ministry for widespread use in AI. Notification could go to the relevant breed society simultaneously with the application. The breed society would be required to state their views to the Ministry within 28 days. Lack of response would be taken to constitute approval. As this process would take place during the period of veterinary tests, no delay to final approval was envisaged. The final decision would remain with the Ministry.

(ii) Discussions should take place on a one to one basis when called for by either breed society or AI organisations to discuss any matter relevant and confidential between parties. Such meetings could provide the basis for discussion on young bulls which could be in the pipe-line or older bulls which had been outclassed.

(iii) Regular consultations should take place between breed societies, Ministry and AI organisations possibly on a Working Party basis similar to those formerly arranged on the dairy side with AI organisations, possible user organisations and breed societies in order to achieve closer involvement on all sides, and better all round understanding.

(iv) Ministry involvement in progeny testing is desirable. Wherever possible information should be obtained and published on ease of calving, mortality, growth rate etc. Where a bull did not have a progeny test, that too should be stated.

94. As a Committee we felt able to agree to objectives (ii) and (iii) on the understanding that the former did not carry with it any obligation to discuss matters of commercial confidentiality. We therefore **recommend** that these be put into effect on this basis. We were unable, however, to agree to objectives (i) and (iv) although we **recommend** that in the course of operating (ii) and (iii) an attempt be made to explore with interested parties the extent to which (i) might be possible. In the case of (iv) we **recommend** that direct discussions take place between interested parties and the Agriculture Departments to explore the matter further.

Controls over dairy breed bulls for use in AI

95. We were asked to consider a proposal that sought to simplify livestock quality controls while simultaneously tightening advertising standards. The basis of this was that young bulls for progeny testing would have a distribution limit of semen. Subsequent acceptance of a bull for the proven category would depend on the number of daughters and contemporaries and a satisfactory spread between herds. There would be no production standards involved at any stage. Any bull would be admitted to the progeny testing category provided it satisfied the necessary health requirements but any advertisement issued in respect of its semen would have to contain all the information currently required to be supplied on demand only in respect of present Grade A (Progeny Testing) bulls. When bulls in the proven category were advertised it was intended that information would have to be provided in line with that currently required for Unclassified bulls, be the most up-to-date available and be accompanied by the date and source so that this might be checked if necessary. Failure to comply with any of these advertising standards could ultimately result in the loss of approval for the bull concerned.

96. While welcoming this proposal as a useful focus for discussion we were divided on its acceptability as a standard for the future. It was generally agreed that much depended upon what weighting and spread would be necessary before a bull could be admitted to the proven category. Some of us felt that too strict a requirement in this respect could unnecessarily restrict a bull with potential simply because it did not have a wide initial proof. With competition from imported semen it was often considered difficult to find enough suitable cows to ensure a wide spread between herds. Others of us, on the other hand, were concerned that if strict entry conditions were not set the genetic quality of the

National Herd would suffer as bulls of a wide spread of merit would all be placed on the same footing in respect of the right to supply unlimited quantities of semen.

97. We were therefore unable to agree on a specific recommendation regarding the form that future livestock quality controls over dairy breed bulls for use in AI should take. All organisations represented among us were agreed, however, that the proposals we had been given provided a basis for more detailed discussions between interested parties and the Agriculture Departments and we recommend that such discussions take place.

PART VI

Summary of conclusions and recommendations

98. Our conclusions and recommendations are as follows.

STANDARDISED INFORMATION SYSTEMS

Production traits in dairy breeds

MILK YIELD AND QUALITY

We **recommend** that:

(a) the ICC base-line for the Friesian/Holstein breed be increased from the beginning of 1985 and that the new datum be set in the light of the latest available evidence;

(b) the base-line for all breeds be kept under review and updated whenever sufficient genetic change has taken place to make it appropriate to do so.

CONFORMATION

We have **concluded** that the goal of achieving uniformity of results throughout the industry or the development of an agreed system of comparison is not attainable at present.

TEMPERAMENT

We have **concluded** that the present system of assessing the temperament of daughters during progeny inspections together with information on what proportion of daughters complete the first lactation provides sufficient data on this characteristic.

EASE OF MILKING

We have **concluded** that the present system of determining ease of milking by the subjective assessment of daughters, coupled with the practice of culling slow milkers adequately allows for this trait.

EASE OF CALVING

We **recommend** that AI centres and owners of bull studs should collect information on ease of calving from whatever source seems most appropriate to them and that this should be used to warn customers against the use of a particular bull on heifers but not to recommend a bull in this respect.

FEED EFFICIENCY

We have **concluded** that reliance on the genetic relationship between yield and feed efficiency is the only practical, albeit indirect, way of measuring and improving feed efficiency.

FERTILITY

We **recommend** that:
(a) all high use bulls (more than 1,000 inseminations in a six month period) owned by AI organisations be assessed on the basis of inseminations carried out within their own areas and that privately owned bulls be assessed on the basis of inseminations carried out in MMB areas only;
(b) owners of bulls which fall into the moderate or low fertility categories be informed and made responsible for publicising the findings to potential semen purchasers.

DISEASE RESISTANCE

We have **concluded** that the possibility of establishing a standard approach to the assessment of disease resistance in cattle, although desirable, is not achievable from a practical point of view at this time.

GENETIC DEFECTS

We **recommend** that the reporting of genetic defects in the progeny of an AI bull be encouraged and that the information so gained be used to prevent an increase in the proportion of abnormal calves born.

Production traits in beef breeds

LIVEWEIGHT GAIN

We **recommend** that a uniform system for publishing data on liveweight gain and other performance indicators, such as that given in Appendix B, be established as a Code of Practice.

CONFORMATION

We have **concluded** that it would not be appropriate for us to make any specific recommendations on this matter.

TEMPERAMENT

We have **concluded** that no recommendation is called for.

EASE OF CALVING

We have **concluded** that the present system of collecting postal or oral reports from farmers is adequate and **recommend** its continuance.

FEED EFFICIENCY

Our **conclusion** on this matter is the same as for dairy breeds.

FERTILITY

Our **recommendations** in respect of dairy breeds are also applicable to beef breeds.

DISEASE RESISTANCE

Our **conclusion** on this matter is the same as for dairy breeds.

GENETIC DEFECTS

Our **recommendation** in respect of dairy breeds is also applicable to beef breeds.

BEEF MERIT OF DAIRY BULLS

We make **no recommendations** in respect of this matter.

ASSESSMENT OF THE EFFECTS OF CHANGES MADE TO THE AI ARRANGEMENTS IN GREAT BRITAIN

We have **concluded** that:

(a) the vast majority of inseminations are carried out with the semen of Class I bulls, that is, those which by virtue of their proof are allowed unlimited distribution of their semen;

(b) of the progeny testing bulls, far more inseminations are carried out with the semen of Grade A bulls than Grade B;

(c) the use of semen of progeny testing bulls falls off rapidly in the third year after their approval and little is likely to be used in the fourth and subsequent years;

(d) a significant proportion of Grade A and Grade B (young) bulls have less than 50 straws of semen distributed in a three-year period (out of limits of 750 and 500 straws respectively);

(e) less than half of Grade A and less than 10% of Grade B bulls achieve a level of uptake of semen in the first three years of approval sufficient to ensure the gaining of an adequate proof while still young;

(f) only a very few progeny testing bulls are used to the limit of their semen approval within a three-year period and that the present limits for young bulls are therefore adequate for the purpose of achieving an effective progeny test;

(g) the general liberalisation of the Regulations introduced in 1980 over those in force earlier is unlikely to have led to an increased demand for semen from bulls of lower genetic merit.

We **recommend** that as the effects of the Regulations on the genetic quality of the National Herd cannot be completely assessed until at least 1991 the monitoring excercise be continued by the Agriculture Departments but only in respect of those bulls already in the system.

THE IMPROVEMENT OF FACILITIES FOR PROGENY TESTING

We have **concluded** that:

(a) existing facilities appear to be adequate for the present and foreseeable size of testing programmes;

(b) better use could be made of the presently available officially recorded cows in Great Britain;

(c) if it is necessary in the future to increase the number of milk-recorded cows available for progeny testing then this can be achieved most effectively by convincing herd owners of the value of recording as a management tool.

PARTICIPATION OF THE CATTLE BREEDING INDUSTRY IN BULL APPROVALS

We **recommend** that:

(a) objectives (ii) and (iii) of the NCBA submission on controls over beef breed bulls for use in AI (paragraph 93) should be put into effect but there should be no obligation to discuss matters of commercial confidentiality;

(b) in the course of achieving (a) above an attempt be made to explore with interested parties the extent to which objective (i) of the submission might be possible;

(c) in the case of objective (iv) of the submission direct discussions take place between interested parties and the Agriculture Departments to explore the matter further;

(d) further detailed discussions should take place between interested parties and the Agriculture Departments on the basis of the proposals put to us for the future control of dairy breed bulls for use in AI (paragraph 95).

APPENDIX A

The improved contemporary comparison

The Improved Contemporary Comparison (ICC) is the best estimate of a bull's transmitting ability. It is, in statistical terms, a best linear unbiased prediction (BLUP) of the relative merit of future daughters of the bull.

An ICC is given for:

kg	Milk
kg	Fat
kg	Protein
%	Fat
%	Protein.

This is what could be expected to be transmitted by the bull. If for instance the ICC for milk is + 100 kg the bull's genetic merit or breeding value would be + 200 kg. This is because only half is transmitted by the sire, the other half by the dam.

In some proofs ICC values are also given for conformation traits, and this is likely to become available for all proofs in the future.

Features of the ICC, as calculated in the UK, are as follows:

(i) Bulls are evaluated relative to a fixed genetic base (limited-use bulls registered during 1962–1967) enabling them to be compared over time.

(ii) The year is divided into three calving seasons
August to November
December to March
April to July.
In the calculation corrections are made for month of calving.

(iii) Adjustments are made for age at calving. The first lactation yields of heifers calving between 22 and 38 months are included in the calculation with the yields of younger heifers being adjusted upwards and those for older heifers being adjusted downwards.

(iv) Statistical adjustments are also made for differences in the genetic merit of the sires of contemporaries and in the genetic merit of the sires of the bull's mates.

(v) A correction is made for the average effect of the group of bulls to which the bull belongs. This is the year of registration in the herd book and takes into account annual genetic progress.

WEIGHTING

This is a calculation of the number of effective daughters included in the ICC.

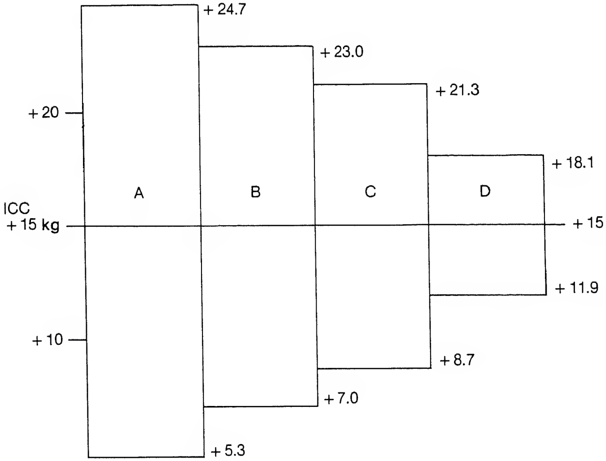
$$\text{WEIGHTING} = \frac{\text{No. of daughters of test bull} \times \text{No. of contemporaries}}{\text{No. of daughters} + \text{No. of contemporaries}}$$

e.g. 12 daughters and 10 contemporaries

$$\text{WEIGHTING} = \frac{12 \times 10}{12 + 10} = \frac{120}{22} = 5.45$$

The higher the weighting the more accurate the proof. This can be illustrated as follows:

Bull A W = 10 Bull B W= 20 Bull C W = 40 Bull D W = 200



This is calculated at 95% confidence limits. In this example the average ICC for all bulls is + 15 kg fat.

Bull A at a weighting of 10 has a 95% chance that his true ICC lies between + 5.3 kg and + 24.7 kg, whereas Bull D with a weighting of 200 has a 95% chance that his true ICC lies between + 11.9 kg and + 18.1 kg. With the present system of testing young bulls through AI a reasonable weighting for an initial widespread proof would be at least 30. As weightings increase in subsequent years the proof for a bull tested on a widespread basis (more than 7 herds) usually changes only slightly, but as already discussed accuracy improves.

APPENDIX B

Information on beef bulls

CODE OF PRACTICE

Performance tested bulls

The organisations offering semen for sale should:

(a) Indicate clearly whether the bull is station-tested or farm weight-recorded.
(b) State weight at 400 days in a format recommended by Meat and Livestock Commission.
(c) State weights at other ages, e.g. 300 and 500 days in the same format if available.
(d) Give consideration to the publication of data on:
    (i) Backfat depths
    (ii) Withers height
    (iii) Relative within-breed feed conversion ratios
    when available

Progeny tested bulls

(a) Indicate clearly whether data are derived from a station or field test.
(b) State the number of records for each bull progeny group; the target number for progeny group is 20.
(c) Where possible, within-breed results should be expressed as deviations from a fixed base and as regressed figures.
(d) Information to be provided on the bull progeny group:
    average;
    (i) birth weight
    (ii) slaughter weight
    (iii) age at slaughter
    (iv) carcase weight
    (v) carcase gain
    (vi) carcase assessment.

Calving information

Where possible, data on calving performance will be collected from a target minimum of 200 cows per bull. In the case of the Aberdeen Angus breed the information will be from the calvings of heifers. In both cases single births only will be included.

Categories of calving difficulty to be recorded:
(i) No assistance
(ii) Some assistance
(iii) Serious difficulty

Calf mortality to be recorded as stillbirth or death within 48 hours of birth. From the above records the following information will be published:
(a) Percentage of serious calving difficulty for individual bulls.
(b) Calf mortality as a percentage for individual bulls.
(c) Breed averages for both of these traits.
(d) Number of records.

APPENDIX C

Semen distribution limits for dairy bulls

Type	Category	Qualifying conditions	Limit (straws)	
			Post – 1 May 1980 (NOTE)	Pre- 1 May 1980
Young bulls under 3 years of age eligible for progeny testing	Grade A (Progeny Testing)	Meet basic pedigree and information standards	750	750
	Grade B (Untested)	Pedigree only	500	750 in not less than 5 nor more than 10 herds
Bulls 3 years of age or over not previously progeny tested	Grade B (Untested)	Pedigree only	500	750 in not less than 5 nor more than 10 herds
Mature bulls eligible for extended AI use.	Unclassified	Minimum ICC weighting of 5 and no conformation or production standards	3,500	Distribution not permitted
	Class 4	ICC weighting of 10 but below 15 and meeting conformation and production standards. Spread of daughters in less than 7 herds.	7,500	5,000
	Class 3	ICC weighting of 15 or more and meeting conformation and production standards. Spread of daughters in less than 7 herds.	15,000	Unlimited
	Class 2	ICC weighting of 10 but below 15 and meeting conformation and production standards. Spread of daughters in 7 or more herds.	15,000	5,000

Type	Category	Qualifying conditions	Limit (straws)	
			Post – 1 May 1980 (NOTE)	Pre- 1 May 1980
Mature bulls eligible for extended AI use	Class 1	ICC weighting of 15 or more and meeting conformation and production standards. Spread of daughters in 7 or more herds.	Unlimited	Unlimited

NOTE: Limits do not apply to use in the owner's herd(s) or, in the case of co-owned bulls, the herds of the first 6 co-owners and those of 3,500 and above are inclusive.

APPENDIX D

Results of three years of monitoring

TABLE 1 FRIESIAN/HOLSTEIN

1980/81

YEAR 1 BULLS

Bull category		A(P/T)	B (Young)	B (Mature)	Un-classified	4	3	2	1	Co-owned	Total
No. of bulls		265	58	73	60	7	8	6	66	26	569
By inseminators	No.	20238	1788	1896	5482	2300	9570	2747	24310	523	ø 73761 99.9%
	%	27.4	2.4	2.6	7.4	3.1	13	3.7	33	0.7	
DIY Inseminations	No.	973	215	252	747	210	303	64	2058	85	
	%	1.3	0.3	0.3	1.0	0.3	0.4	0.1	2.8	0.1	

YEAR 2 BULLS

YEAR 3 BULLS

TOTALS

Bull category		A(P/T)	B (Young)	B (Mature)	Un-classified	4	3	2	1	Co-owned	Total
No. of bulls		265	58	73	60	7	8	6	66	26	569
By inseminators	No.	20238	1788	1896	5482	2300	9570	2747	24310	523	ø 73761 99.9%
	%	27.4	2.4	2.6	7.4	3.1	13	3.7	33	0.7	
DIY inseminations	No.	973	215	252	747	210	303	64	2058	85	
	%	1.3	0.3	0.3	1.0	0.3	0.4	0.1	2.8	0.1	

ø Bulls may be approved for use in AI at any time so the average length of use in the first year of recording would only be around 6 months. This accounts for the apparent lower number of inseminations recorded for bulls in this period.

1981/82

Bull category		A(P/T)	B (Young)	B (Mature)	Un-classified	4	3	2	1	Co-owned	Total
No. of bulls		260	58	69	49	6	6	2	66	18	534
By inseminators	No.	34884	2472	3110	3373	726	8647	193	163184	545	235399 99.9%
	%	14.8	1.0	1.3	1.4	0.3	3.7	0.1	69.3	0.2	
DIY inseminations	No.	3032	948	782	674	89	694	94	11755	197	
	%	1.2	0.4	0.3	0.3	0.1	0.3	0.1	5.0	0.1	

Bull category		A(P/T)	B (Young)	B (Mature)	Un-classified	4	3	2	1	Co-owned	Total
No. of bulls		234	58	27	30	9	5	2	38	19	422
By inseminators	No.	24954	4082	565	2587	817	14510	154	67737	211	ø 135123 100%
	%	18.5	3.0	0.4	1.9	0.6	10.7	0.1	50.1	0.2	
DIY inseminations	No.	2099	753	414	815	341	3957	–	10963	164	
	%	1.6	0.6	0.3	0.6	0.3	2.9	–	8.1	0.1	

Bull category		A(P/T)	B (Young)	B (Mature)	Un-classified	4	3	2	1	Co-owned	Total
No. of bulls		494	116	96	79	15	11	4	104	37	956
By inseminators	No.	59838	6554	3675	5960	1543	23157	347	230921	756	370522 100%
	%	16.1	1.8	1.0	1.6	0.4	6.2	0.1	62.3	0.2	
DIY inseminations	No.	5131	1701	1196	1489	430	4651	94	22718	361	
	%	1.4	0.5	0.4	0.4	0.1	1.3	0.1	6.1	0.1	

Any slight differences between years of the number of recorded bulls is mainly attributable to their recategorisations. However, in a few cases this does not account entirely for the observable differences and this may be explained by the omission of a few bulls from the lists in earlier years or their inclusion in incorrect approval categories.

1982/83

YEAR 1 BULLS

Bull category		A(P/T)	B (Young)	B (Mature)	Un-classified	4	3	2	1	Co-owned	Total
No. of bulls		259	58	68	47	6	3	1	65	18	525
By inseminators	No.	8506	1293	3352	2366	461	2412	-	294567	419	360144 100%
	%	2.4	0.4	0.9	0.7	0.1	0.7	-	81.8	0.1	
DIY inseminations	No.	3520	909	1005	912	70	246	35	39749	322	
	%	1.0	0.2	0.3	0.2	*	*	*	11.0	*	

YEAR 2 BULLS

Bull category		A(P/T)	B (Young)	B (Mature)	Un-classified	4	3	2	1	Co-owned	Total
No. of bulls		244	54	25	23	6	1	1	43	18	415
By inseminators	No.	26243	3742	1837	2658	558	2041	40	128374	308	195829 100%
	%	13.4	1.9	0.9	1.4	0.3	1.0	*	65.5	0.2	
DIY inseminations	No.	3923	945	900	917	417	1182	-	21442	302	
	%	2.0	0.5	0.5	0.5	0.2	0.6	-	10.9	0.2	

YEAR 3 BULLS

Bull category		A(P/T)	B (Young)	B (Mature)	Un-classified	4	3	2	1	Co-owned	Total
No. of bulls		259	39	28	25	6	6	-	90	13	466
By inseminators	No.	35328	1165	769	1303	3796	10290	-	161574	61	ø 251996 100%
	%	14.0	0.5	0.3	0.5	1.5	4.0	-	64.1	*	
DIY inseminations	No.	5795	542	676	964	1141	2442	-	25955	195	
	%	2.3	0.2	0.3	0.4	0.5	1.0	-	10.3	*	

TOTALS

Bull category		A(P/T)	B (Young)	B (Mature)	Un-classified	4	3	2	1	Co-owned	Total
No. of bulls		762	151	121	95	18	10	2	198	49	1406
By inseminators	No.	70077	6200	5958	6327	4815	14743	40	584515	788	807969 100%
	%	8.7	0.8	0.7	0.8	0.6	1.8	*	72.3	0.1	
DIY inseminations	No.	13238	2396	2581	2793	1628	3870	35	87146	819	
	%	1.6	0.3	0.3	0.3	0.2	0.5	*	10.8	0.1	

Any slight differences between years of the number of recorded bulls is mainly attributable to their recategorisations. However, in a few cases this does not account entirely for the observable differences and this may be explained by the omission of a few bulls from the lists in earlier years or their inclusion in incorrect approval categories.

* = Less than 0.1%   ø See page 52

TABLE 2 AYRSHIRE

1980/81

YEAR 1 BULLS

Bull category		A(P/T)	B (Young)	B (Mature)	Un-classified	4	3	2	1	Co-owned	Total
No. of bulls		10	6	4	9	3	1	2	2	3	40
By inseminators	No.	786	89	44	413	1992	595	2604	41	9	ø 6853 100.0%
	%	11.5	1.3	0.6	6.0	29.1	8.7	38.0	0.6	0.1	
DIY inseminations	No.	39	–	27	30	118	35	26	–	5	
	%	0.6	–	0.4	0.4	1.7	0.5	0.4	–	0.1	

YEAR 2 BULLS

YEAR 3 BULLS

TOTALS

Bull category		A(P/T)	B (Young)	B (Mature)	Un-classified	4	3	2	1	Co-owned	Total
No. of bulls		10	6	4	9	3	1	2	2	3	40
By inseminators	No.	786	89	44	413	1992	595	2604	41	9	ø 6853 100.0%
	%	11.5	1.3	0.6	6.0	29.1	8.7	38.1	0.6	0.1	
DIY inseminations	No.	39	–	27	30	118	35	26	–	5	
	%	0.6	–	0.4	0.4	1.7	0.5	0.4	–	0.1	

ø See page 46

1981/82

YEAR 1 BULLS

Bull category		A(P/T)	B (Young)	B (Mature)	Un-classified	4	3	2	1	Co-owned	Total
No. of bulls		9	5	4	9	3	1	–	–	3	34
By insem-inators	No.	1064	56	21	2873	2717	354	–	–	89	8834 99.9%
	%	12.0	0.6	0.2	32.5	30.8	4.0	–	–	1.0	
DIY insem-inations	No.	271	27	56	545	731	–	–	–	30	
	%	3.1	0.3	0.6	6.2	8.3	–	–	–	0.3	

YEAR 2 BULLS

Bull category		A(P/T)	B (Young)	B (Mature)	Un-classified	4	3	2	1	Co-owned	Total
No. of bulls		8	4	8	1	2	–	–	4	1	28
By insem-inators	No.	300	–	50	74	1209	–	–	4171	–	ø
	%	4.2	–	0.7	1.0	16.9	–	–	58.4	–	7140 99.9%
DIY insem-inations	No.	385	–	192	15	617	–	–	127	–	
	%	5.4	–	2.7	0.2	8.6	–	–	1.8	–	

YEAR 3 BULLS

TOTALS

Bull category		A(P/T)	B (Young)	B (Mature)	Un-classified	4	3	2	1	Co-owned	Total
No. of bulls		17	9	12	10	5	1	–	4	4	62
By insemi-inators	No.	1364	56	71	2947	3926	354	–	4171	89	15974 100.1%
	%	8.5	0.4	0.4	18.5	24.6	2.2	–	26.1	0.6	
DIY insem-inations	No.	656	27	248	560	1348	–	–	127	30	
	%	4.1	0.2	1.6	3.5	8.4	–	–	0.8	0.2	

Any slight differences between years of the number of recorded bulls is mainly attributable to their recategorisations. However, in a few cases this does not account entirely for the observable differences and this may be explained by the omission of a few bulls from the lists in earlier years or their inclusion in incorrect approval categories.

ø See page 46

1982/83

Bull category		A(P/T)	B (Young)	B (Mature)	Un-classified	4	3	2	1	Co-owned	Total
No. of bulls		8	4	4	7	3	1	–	–	2	30
By insem-inators	No.	573	71	94	132	3608	179	–	–	–	5660 100%
	%	10.1	1.3	1.7	2.3	63.7	3.2	–	–	–	
DIY Insem-inations	No.	217	42	–	63	589	78	–	–	14	
	%	3.8	0.7	–	1.1	10.4	1.4	–	–	0.3	

Bull category		A(P/T)	B (Young)	B (Mature)	Un-classified	4	3	2	1	Co-owned	Total
No. of bulls		8	2	8	–	2	–	–	4	1	25
By insem-inators	No.	1062	–	101	–	1454	–	–	7703	–	11396 100%
	%	9.3	–	0.9	–	12.8	–	–	67.6	–	
DIY Insem-inations	No.	276	–	154	–	431	–	–	215	–	
	%	2.4	–	1.4	–	3.8	–	–	1.8	–	

Bull category		A(P/T)	B (Young)	B (Mature)	Un-classified	4	3	2	1	Co-owned	Total
No. of bulls		15	10	10	7	3	3	–	9	2	59
By insem-inators	No.	2433	376	2	120	401	1281	–	2229	7	ø
	%	28.8	4.5	*	1.4	4.8	15.2	–	26.4	*	8442 100%
DIY Insem-inations	No.	299	440	60	78	81	316	–	319	–	
	%	3.5	5.2	0.7	0.9	1.0	3.7	–	3.8	–	

Bull category		A(P/T)	B (Young)	B (Mature)	Un-classified	4	3	2	1	Co-owned	Total
No. of bulls		31	17	22	14	8	4	–	13	5	114
By insem-inators	No.	4068	447	197	252	5463	460	–	9932	7	25498 100%
	%	15.9	1.8	0.8	1.0	21.4	5.7	–	39.0	*	
DIY insem-inations	No.	792	482	214	141	1101	394	–	534	14	
	%	3.1	1.9	0.8	0.6	4.3	1.5	–	2.1	*	

Any slight differences between years of the number of recorded bulls is mainly attributable to their recategorisations. However, in a few cases this does not account entirely for the observable differences and this may be explained by the omission of a few bulls from the lists in earlier years or their inclusion in incorrect approval categories.

*** = Less than 0.1%** ø See page 46

TABLE 3 JERSEY

1980/81

YEAR 1 BULLS

Bull category		A(P/T)	B (Young)	B (Mature)	Un-classified	4	3	2	1	Co-owned	Total
No. of bulls		8	5	2	3	2	1	–	2	–	23
By insem-inators	No.	441	104	–	71	179	252	–	192	–	ø
	%	34.6	8.1	–	5.6	14.1	19.8	–	15.1	–	1273 100%
DIY insem-inations	No.	6	5	–	5	–	18	–	–	–	
	%	0.5	0.4	–	0.4	–	1.4	–	–	–	

YEAR 2 BULLS

YEAR 3 BULLS

TOTALS

Bull category		A(P/T)	B (Young)	B (Mature)	Un-classified	4	3	2	1	Co-owned	Total
No. of bulls		8	5	2	3	2	1	–	2	–	23
By insem-inators	No.	441	104	–	71	179	252	–	192	–	ø
	%	34.6	8.1	–	5.6	14.1	19.8	–	15.1	–	1273 100%
DIY insem-inations	No.	6	5	–	5	–	18	–	–	–	
	%	0.5	0.4	–	0.4	–	1.4	–	–	–	

ø See page 46

1981/82

Bull category		A(P/T)	B (Young)	B (Mature)	Un-classified	4	3	2	1	Co-owned	Total
No. of bulls		9	5	2	3	1	1	—	2	–	23
By insem-inators	No.	976	167	93	99	790	1128	–	812	–	
	%	23.3	4.0	2.2	2.4	18.9	27.0	–	19.4	–	4191 100.2%
DIY insem-inations	No.	13	–	26	–	11	39	–	47	–	
	%	0.3	–	0.4	–	0.3	0.9	–	1.1	–	

Bull category		A(P/T)	B (Young)	B (Mature)	Un-classified	4	3	2	1	Co-owned	Total
No. of bulls		10	2	2	1	1	1	–	5	–	22
By insem-inators	No.	453	117	203	32	21	53	–	3480	–	ø
	%	10.3	2.7	4.6	0.7	0.5	1.2	–	78.9	–	4413 100.2%
DIY insem-inations	No.	–	–	40	12	2	–	–	–	–	
	%	–	–	0.9	0.3	0.1	–	–	–	–	

Bull category		A(P/T)	B (Young)	B (Mature)	Un-classified	4	3	2	1	Co-owned	Total
No. of bulls		19	7	4	4	2	2	–	7	–	45
By insem-inators	No.	1429	284	296	131	811	1181	–	4292	–	
	%	16.6	3.3	3.4	1.5	9.4	13.7	–	48.9	–	8604 100%
DIY insem-inations	No.	13	–	56	12	13	39	–	47	–	
	%	0.2	–	0.7	0.1	0.2	0.5	–	0.5	–	

Any slight differences between years of the number of recorded bulls is mainly attributable to their recategorisations. However, in a few cases this does not account entirely for the observable differences and this may be explained by the omission of a few bulls from the lists in earlier years or their inclusion in incorrect approval categories.

ø See page 46

1982/83

YEAR 1 BULLS

Bull category		A(P/T)	B (Young)	B (Mature)	Un-classified	4	3	2	1	Co-owned	Total
No. of bulls		9	5	2	2	–	1	–	2	–	21
By inseminators	No.	287	45	91	120	–	22	–	1088	–	1876 100%
	%	15.3	2.4	4.8	6.4	–	1.2	–	58.0	–	
DIY inseminations	No.	13	–	–	137	–	18	–	55	–	
	%	0.7	–	–	7.3	–	1.0	–	2.9	–	

YEAR 2 BULLS

Bull category		A(P/T)	B (Young)	B (Mature)	Un-classified	4	3	2	1	Co-owned	Total
No. of bulls		10	1	3	–	1	1	–	9	–	25
By inseminators	No.	6767	40	176	–	30	1957	–	7987	–	17237 100%
	%	39.3	0.2	1.0	–	0.2	11.3	–	46.3	–	
DIY inseminations	No.	17	–	–	–	–	133	–	130	–	
	%	0.1	–	–	–	–	0.8	–	0.8	–	

YEAR 3 BULLS

Bull category		A(P/T)	B (Young)	B (Mature)	Un-classified	4	3	2	1	Co-owned	Total
No. of bulls		7	4	1	–	–	1	–	7	–	20
By inseminators	No.	1037	79	9	–	–	10473	–	749	–	ø 12618 100%
	%	8.2	0.6	*	–	–	83.0	–	5.9	–	
DIY inseminations	No.	45	10	–	–	–	63	–	153	–	
	%	0.4	*	–	–	–	0.5	–	1.2	–	

TOTALS

Bull category		A(P/T)	B (Young)	B (Mature)	Un-classified	4	3	2	1	Co-owned	Total
No. of bulls		26	10	6	2	1	3	–	18	–	66
By inseminators	No.	8091	164	276	120	30	12452	–	9824	–	31731 100%
	%	25.5	0.5	0.9	0.4	*	39.2	–	31.0	–	
DIY inseminations	No.	75	10	–	137	–	214	–	338	–	
	%	0.2	*	–	0.4	–	0.7	–	1.1	–	

Any slight differences between years of the number of recorded bulls is mainly attributable to their recategorisations. However, in a few cases this does not account entirely for the observable differences and this may be explained by the omission of a few bulls from the lists in earlier years or their inclusion in incorrect approval categories.

* = Less than 0.1% ø See page 46

TABLE 4 GUERNSEY

1980/81

	Bull category		A(P/T)	B (Young)	B (Mature)	Un-classified	4	3	2	1	Co-owned	Total
YEAR 1 BULLS	No. of bulls		3	3	2	5	1	1	-	1	-	16
	By insem-inators	No.	42	-	37	92	56	1238	-	466	-	ø
		%	2.2	-	1.9	4.7	2.9	63.4	-	23.9	-	1952 100.1%
	DIY Insem-inations	No.	-	-	-	-	-	18	-	3	-	
		%	-	-	-	-	-	0.9	-	0.2	-	

YEAR 2 BULLS

YEAR 3 BULLS

	Bull category		A(P/T)	B (Young)	B (Mature)	Un-classified	4	3	2	1	Co-owned	Total
TOTALS	No. of bulls		3	3	2	5	1	1	-	1	-	16
	By insem-inators	No.	42	-	37	92	56	1238	-	466	-	ø
		%	2.2	-	1.9	4.7	2.9	63.4	-	23.9	-	1952 100.1%
	DIY insem-inations	No.	-	-	-	-	-	18	-	3	-	
		%	-	-	-	-	-	0.9	-	0.2	-	

ø See page 46

1981/82

YEAR 1 BULLS

Bull category		A(P/T)	B (Young)	B (Mature)	Un-classified	4	3	2	1	Co-owned	Total
No. of bulls		3	3	2	5	1	1	–	1	–	16
By insem-inators	No.	303	121	50	79	29	1477	–	261	–	2465 100%
	%	12.3	4.9	2.0	3.2	1.2	59.9	–	10.6	–	
DIY insem-inations	No.	13	15	–	4	–	47	–	66	–	
	%	0.5	0.6	–	0.2	–	1.9	–	2.7	–	

YEAR 2 BULLS

Bull category		A(P/T)	B (Young)	B (Mature)	Un-classified	4	3	2	1	Co-owned	Total
No. of bulls		2	6	–	4	1	–	–	1	–	14
By insem-inators	No.	158	104	–	9	23	–	–	1836	–	ø 2177 100.1%
	%	7.3	4.8	–	0.4	1.1	–	–	84.3	–	
DIY insem-inations	No.	15	6	–	14	–	–	–	12	–	
	%	0.7	0.3	–	0.6	–	–	–	0.6	–	

YEAR 3 BULLS

TOTALS

Bull category		A(P/T)	B (Young)	B (Mature)	Un-classified	4	3	2	1	Co-owned	Total
No. of bulls		5	9	2	9	2	1	–	2	–	30
By insem-inators	No.	461	225	50	88	52	1477	–	2097	–	4642 100.2%
	%	9.9	4.9	1.1	1.9	1.1	31.9	–	45.2	–	
DIY insem-inations	No.	28	21	–	18	–	47	–	78	–	
	%	0.6	0.5	–	0.4	–	1.0	–	1.7	–	

Any slight differences between years of the number of recorded bulls is mainly attributable to their recategorisations. However, in a few cases this does not account entirely for the observable differences and this may be explained by the omission of a few bulls from the lists in earlier years or their inclusion in incorrect approval categories.

ø See page 46

1982/83

Bull category		A(P/T)	B (Young)	B (Mature)	Un-classified	4	3	2	1	Co-owned	Total
No. of bulls		3	3	2	5	1	1	–	1	–	16
By insem-inators	No.	134	161	–	42	13	1124	–	560	–	2150 100%
	%	6.2	7.5	–	2.0	0.6	52.3	–	26.0	–	
DIY insem-inations	No.	–	–	–	–	–	95	–	21	–	
	%	–	–	–	–	–	4.4	–	1.0	–	

Bull category		A(P/T)	B (Young)	B (Mature)	Un-classified	4	3	2	1	Co-owned	Total
No. of bulls		2	6	–	3	1	–	–	2	–	14
By insem-inators	No.	76	239	–	45	38	–	–	3488	–	3909 100%
	%	1.9	6.1	–	1.2	1.0	–	–	89.2	–	
DIY insem-inations	No.	–	9	–	–	–	–	–	14	–	
	%	–	0.2	–	–	–	–	–	0.4	–	

Bull category		A(P/T)	B (Young)	B (Mature)	Un-classified	4	3	2	1	Co-owned	Total
No. of bulls		7	4	2	4	1	4	–	–	1	23
By insem-inators	No.	612	76	256	190	–	442	–	–	5	ø 1849 100%
	%	33.1	4.1	13.8	10.3	–	23.9	–	–	0.3	
DIY insem-inations	No.	40	10	121	–	–	97	–	–	–	
	%	2.2	0.5	6.5	–	–	5.3	–	–	–	

Bull category		A(P/T)	B (Young)	B (Mature)	Un-classified	4	3	2	1	Co-owned	Total
No. of bulls		12	13	4	12	3	5	–	3	1	53
By insem-inators	No.	822	476	256	277	51	1566	–	4048	5	7908 100%
	%	10.4	60	3.2	3.5	0.7	19.8	–	51.2	*	
DIY insem-ations	No.	40	19	121	–	–	192	–	35	–	
	%	0.5	0.2	1.5	–	–	2.4	–	0.4	–	

Any slight differences between years of the number of recorded bulls is mainly attributable to their recategorisations. However, in a few cases this does not account entirely for the observable differences and this may be explained by the omission of a few bulls from the lists in earlier years or their inclusion in incorrect approval categories.

* = Less than 0.1% ø See page 46

TABLE 5 DAIRY SHORTHORN

YEAR 1 BULLS

1980/81

Bull category		A(P/T)	B (Young)	B (Mature)	Un-classified	4	3	2	1	Co-owned	Total
No. of bulls		4	4	1	3	–	–	–	3	–	15
By inseminators	No.	41	15	13	84	–	–	–	2	–	ø 155 98.8%
	%	26.5	9.7	8.4	54.2	–	–	–	1.3	–	
DIY inseminations	No.	–	–	–	–	–	–	–	–	–	
	%	–	–	–	–	–	–	–	–	–	

1981/82

Bull category		A(P/T)	B (Young)	B (Mature)	Un-classified	4	3	2	1	Co-owned	Total
No. of bulls		4	4	1	3	–	–	–	1	–	13
By inseminators	No.	681	43	20	141	–	–	–	–	–	889 99.8%
	%	76.6	4.8	2.2	15.8	–	–	–	–	–	
DIY inseminations	No.	4	–	–	–	–	–	–	–	–	
	%	0.4	–	–	–	–	–	–	–	–	

YEAR 2 BULLS

Bull category		A(P/T)	B (Young)	B (Mature)	Un-classified	4	3	2	1	Co-owned	Total
No. of bulls		5	2	1	–	–	–	–	1	1	10
By inseminators	No.	69	–	–	–	–	–	–	19	–	ø 88 100%
	%	78.4	–	–	–	–	–	–	21.6	–	
DIY inseminations	No.	–	–	–	–	–	–	–	–	–	
	%	–	–	–	–	–	–	–	–	–	

YEAR 3 BULLS

TOTALS

Bull category		A(P/T)	B (Young)	B (Mature)	Un-classified	4	3	2	1	Co-owned	Total
No. of bulls		4	4	1	3	–	–	–	3	–	15
By inseminators	No.	41	15	13	84	–	–	–	2	–	ø 155 98.8%
	%	26.5	9.7	9.4	54.2	–	–	–	1.3	–	
DIY inseminators	No.	–	–	–	–	–	–	–	–	–	
	%	–	–	–	–	–	–	–	–	–	

Bull category		A(P/T)	B (Young)	B (Mature)	Un-classified	4	3	2	1	Co-owned	Total
No. of bulls		9	6	2	3	–	–	–	2	1	23
By inseminators	No.	750	43	20	141	–	–	–	19	–	977 99.9%
	%	76.8	4.4	2.0	14.4	–	–	–	1.9	–	
DIY inseminations	No.	4	–	–	–	–	–	–	–	–	
	%	0.4	–	–	–	–	–	–	–	–	

ø See page 46

Any slight differences between years of the number of bulls is mainly attributable to their recategorisations. However in a few cases this does not amount entirely for the differences and this may be explained by the omission of a few bulls from the lists in earlier years or their inclusion in incorrect categories.

ø See page 46

1982/83

YEAR 1 BULLS

Bull category		A(P/T)	B (Young)	B (Mature)	Un- classified	4	3	2	1	Co- owned	Total
No. of bulls		4	4	1	3	–	–	–	1	–	13
By insem- inators	No.	666	255	19	189	–	–	–	–	–	1129 100%
	%	59.0	22.6	1.7	16.7	–	–	–	–	–	
DIY insem- inations	No.	–	–	–	–	–	–	–	–	–	
	%	–	–	–	–	–	–	–	–	–	

YEAR 2 BULLS

Bull category		A(P/T)	B (Young)	B (Mature)	Un- classified	4	3	2	1	Co- owned	Total
No. of bulls		5	2	1	–	–	–	–	1	1	10
By insem- inators	No.	507	119	95	–	–	–	–	100	–	821 100%
	%	61.7	14.5	11.6	–	–	–	–	12.2	–	
DIY insem- inations	No.	–	–	–	–	–	–	–	–	–	
	%	–	–	–	–	–	–	–	–	–	

YEAR 3 BULLS

Bull category		A(P/T)	B (Young)	B (Mature)	Un- classified	4	3	2	1	Co- owned	Total
No. of bulls		2	2	–	2	–	–	–	3	1	10
By insem- inators	No.	99	6	–	16	–	–	–	93	5	ø 219 100%
	%	45.2	2.7	–	7.3	–	–	–	42.5	2.3	
DIY insem- inations	No.	–	–	–	–	–	–	–	–	–	
	%	–	–	–	–	–	–	–	–	–	

TOTALS

Bull category		A(P/T)	B (Young)	B (Mature)	Un- classified	4	3	2	1	Co- owned	Total
No. of bulls		11	8	2	5	–	–	–	5	2	33
By insem- inators	No.	1272	380	114	205	–	–	–	193	5	1269 100%
	%	58.6	17.5	5.3	9.5	–	–	–	8.9	0.2	
DIY insem- inations	No.	–	–	–	–	–	–	–	–	–	
	%	–	–	–	–	–	–	–	–	–	

Any slight differences between years of the number of bulls is mainly attributable to their recategorisations. However in a few cases this does not account entirely for the differences and this may be explained by the omission of a few bulls from the lists in earlier years or their inclusion in incorrect categories.

ø See page 46

TABLE 6 USE OF YEAR 1 YOUNG BULLS OVER THE THREE YEAR MONITORING PERIOD.

	Grade A (P/T)			Grade B (P/T)		
	No. of inseminations	No. of bulls	Insem/ bull	No. of inseminations	No. of bulls	Insem/ bull
(1) Friesian/ Holstein						
1980/81	21211	265	80.04	2003	58	34.53
1981/82	37916	260	145.83	3420	58	58.97
1982/83	12026	259	46.43	2202	57	38.65
			272.30			132.15
(2) Ayrshire						
1980/81	825	10	82.50	89	6	14.83
1981/82	1335	9	148.33	83	5	16.60
1982/83	790	7	112.86	113	5	22.60
			343.69			54.03
(3) Jersey						
1980/81	447	8	55.88	109	5	21.80
1981/82	989	9	109.89	167	5	33.40
1982/83	300	9	33.33	45	5	9.00
			199.10			64.20
(4) Guernsey						
1980/81	42	3	14.00	0	3	0
1981/82	316	3	105.30	136	3	45.33
1982/83	134	3	44.67	161	3	53.67
			163.97			99.00
(5) Shorthorn						
1980/81	41	4	10.25	15	4	3.75
1981/82	685	4	171.25	43	4	10.75
1982/83	666	4	166.50	255	4	63.75
			348.00			78.25

This table relates to Year 1 bulls only and indicates first inseminations in each of the three years of the monitoring.

Diagram 1–number of first inseminations by Friesian/Holstein Year 1 young bulls in the three-year period 1980/83.

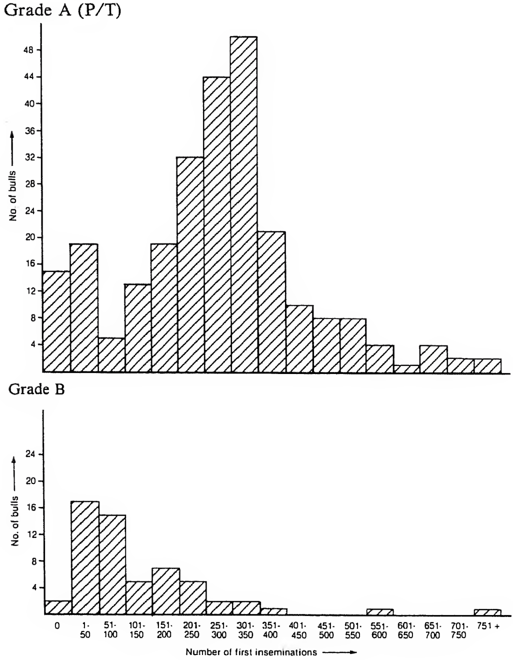
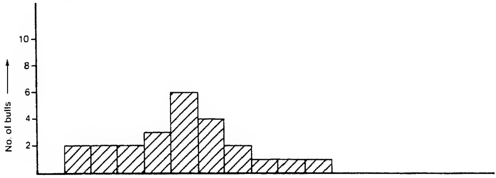


Diagram 2–combined total first inseminations by Ayrshire, Jersey, Guernsey and Dairy Shorthorn Year 1 young bulls in the three-year period 1980/83.

Grade A (P/T)



Grade B

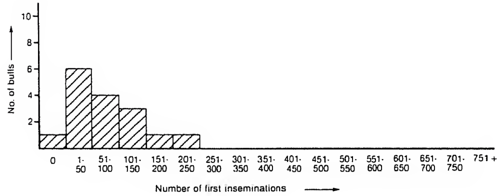
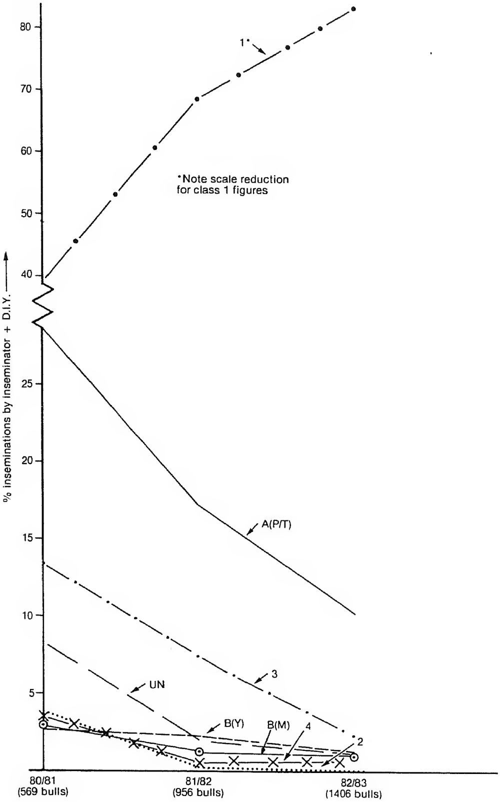


Diagram 3–post-May 1980 approved bulls: % annual use by approval category–Friesian/Holstein.



KEY:

A (P/T) = Grade A (Progeny Testing)

B (Y) = Grade B (Young bulls)

B (M) = Grade B (Mature bulls)

1 = Class 1

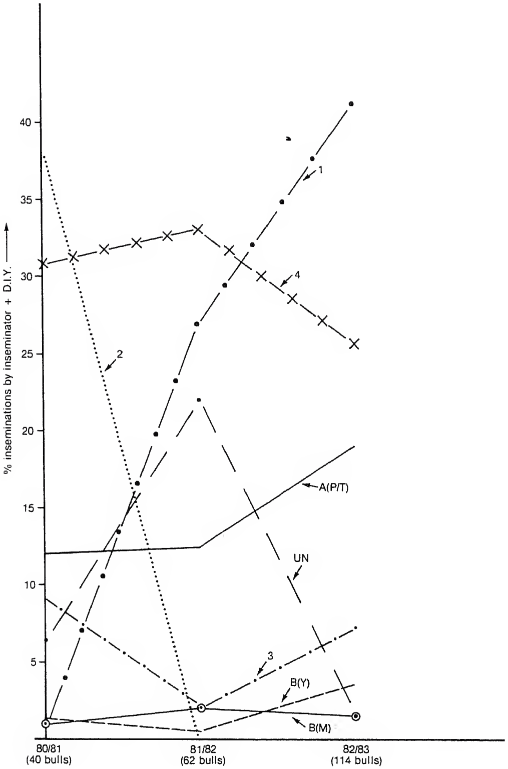
2 = Class 2

3 = Class 3

4 = Class 4

UN = Unclassified.

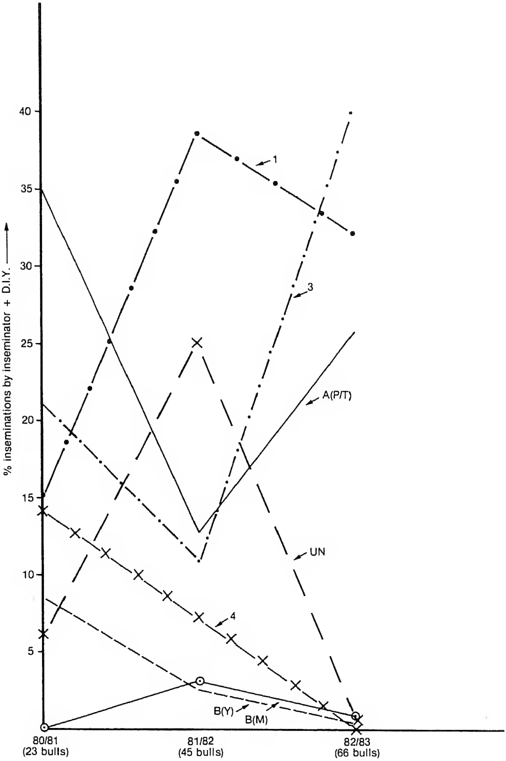
Diagram 4–post-May 1980 approved bulls: % annual use by approval category–Ayrshire.



KEY:

A (P/T)	=	Grade A (Progeny Testing)
B (Y)	=	Grade B (Young bulls)
B (M)	=	Grade B (Mature bulls)
1	=	Class 1
2	=	Class 2
3	=	Class 3
4	=	Class 4
UN	=	Unclassified.

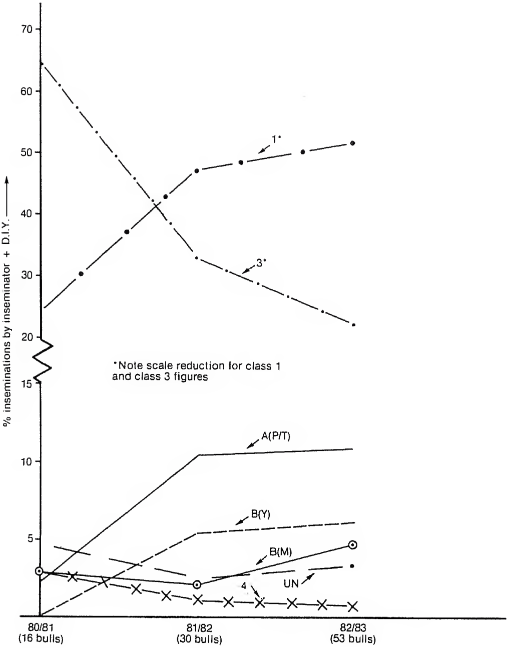
Diagram 5–post-May 1980 approved bulls: % annual use by approval category–Jersey.



KEY:

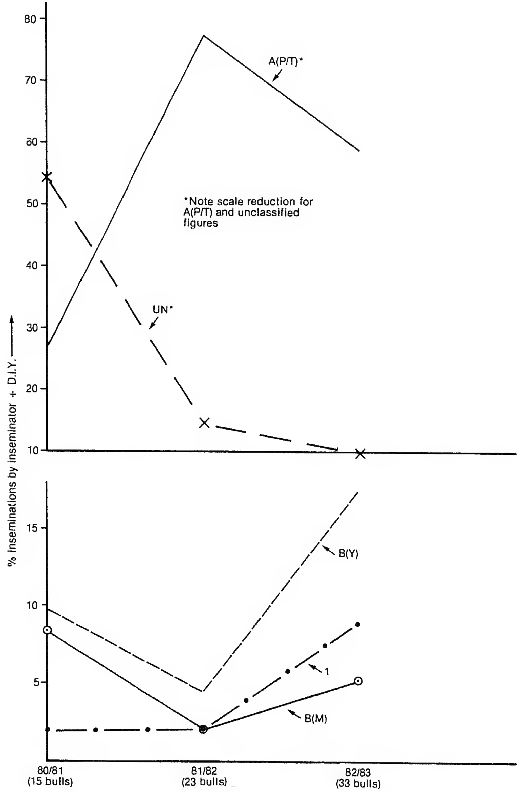
A (P/T)	=	Grade A (Progeny Testing)
B (Y)	=	Grade B (Young bulls)
B (M)	=	Grade B (Mature bulls)
1	=	Class 1
3	=	Class 3
4	=	Class 4
UN	=	Unclassified

Diagram 6–post-May 1980 approved bulls: % annual use by approval category–Guernsey.



KEY:
A (P/T) = Grade A (Progeny Testing)
B (Y) = Grade B (Young bulls)
B (M) = Grade B (Mature bulls)
1 = Class 1
3 = Class 3
4 = Class 4
UN = Unclassified.

Diagram 7–post-May 1980 approved bulls: % annual use by approval category–Dairy Shorthorns.



KEY:

A (P/T) = Grade A (Progeny Testing)
B (Y) = Grade B (Young bulls)
B (M) = Grade B (Mature bulls)
1 = Class 1
UN = Unclassified.

APPENDIX E

Milk recording and progeny testing in Great Britain

This paper is a summary of the points made in submissions from the AAIC, ABRO, FUW, MMB, NCBA, NFU, SFU and SMMB.

1a THE PRESENT LEVEL OF RECORDING

Table 1 shows that the percentage of all dairy cows which are officially recorded has increased over the past 7 years.

Table 1 Number of milk recorded cows & percentage of total dairy cows

Year	England & Wales		Scotland	
	NMR cows	% of total	SMR cows	% of total
1974	919,700	32.2	115,514	34.7
1975	923,368	34.3	121,787	35.7
1976	952,903	34.9	126,808	38.5
1977	1,001,551	36.3	127,602	40.6
1978	1,063,929	38.3	135,718	42.6
1979	1,118,893	41.0	140,079	44.3
1980	1,127,758	42.2	133,858	45.6
1981	1,156,374	43.8	131,116	45.2
1982	1,226,159	45.0	136,164	45.2
1983	1,296,892	46.7	-	-

Table 2 shows for England and Wales the figures for 1978/79 on a per breed basis.

Table 2 Number of cows/heifers in the milk recording scheme (completing lactations)

Breed	No. of cows/ heifers	Percentage of total
Ayrshire	28,080	3.0
Friesian/Holstein	819,302	86.6
Guernsey	22,984	2.4
Jersey	23,607	2.5
All Breeds	945,630	-

1b THE PROPORTION OF COWS USED FOR PROGENY TESTING

The figures used in the tables which follow refer to the numbers/proportions of recorded cows used or estimated to be needed to sustain the present level of progeny testing through AI in England and Wales and in Scotland. It should be borne in mind, however, that recorded cows are mated to young bulls by natural service each year but it is not possible to estimate, reliably, what proportion are used in such progeny tests.

England and Wales

From the 1979 figures in Tables 1 and 2 above the MMB has estimated the total recorded populations of the major breeds to give Table 3. This table also contains estimates of the numbers of bulls tested per year; the number of cows mated to young bulls and the proportion of all recorded cows mated to the young bulls.

The numbers of bulls involved are somewhat arbitrary having been estimated from the numbers of MAFF progeny test licence applications and MMB Artificial Insemination code number allocations. Because the numbers are somewhat arbitrary alternative figures have been given for Friesian-Holstein and Jerseys, based on ICC statistics, in order to provide a range.

Table 3 Number of bulls tested and percentage of cows mated to young bulls

Breed	Recorded cows	No. of bulls tested per year	No. of test cows	% of recorded cows
Friesian/Holstein	968,961	400	90,000	9.4
		200*	60,800	6.3
Ayrshire	33,566	25	5,625	16.8
Jersey	27,972	25	5,625	20.1
		14*	4,256	15.2
Guernsey	26,853	12	2,700	10.1

*In these cases 400 straws of semen, giving 304 first inseminations, have been used in the calculations whilst in all other cases 300 straws of semen, giving 228 first inseminations, have been assumed.

The NCBA estimates that the Milk Marketing Board tests approx. 120 Friesian-Holstein bulls per year and uses 330 cows per bull. Independent AI organisations, breed societies and breeder groups test approx. 60 Friesian-Holstein bulls (including imported animals) annually and inseminate approx. 450 cows per bull. In 1979 private breeders progeny tested 80 young bulls on 450 cows each. Thus the current annual requirement for the major dairy breeds is a little over 102,600 pregnancies for progeny testing or 10% approx. of the total recorded cows. Bearing in mind that both the MMB and NCBA figures use estimates of the numbers of bulls tested, then the resulting proportions of recorded cows required for progeny testing are very similar.

Scotland

The numbers of inseminations, by young SMMB bulls, in recorded herds in 1979 were: Ayrshire – approx. 700 and Friesian-Holstein – 1,333. However, the numbers of cows completing lactations in recorded herds in 1979 were: Ayrshire – 43,862 and Friesian-Holstein – 64,355. Thus the approximate proportions of all recorded cows in each breed used for progeny testing SMMB young bulls were: Ayrshire – 1.6% and Friesian-Holstein – 2.1%. (Census figures indicate that about ⅓ of the calves born in recorded herds are by AI so the figures become, say 4.8% of *recorded AI bred* Ayrshires and 6.3% of *recorded AI bred* Friesian-Holsteins.)

The above figures refer to 5 Ayrshire and 6 Friesian-Holstein bulls. But, of course, other than SMMB-owned bulls are progeny tested in Scotland. In total in 1979, 8 Ayrshire and 28 Friesian-Holstein bulls were given progeny tests or Breeders' Herd licences. On the assumption, therefore, that 40–50 bulls are tested annually in Scotland and that 350 first inseminations are carried out from each, some 14,000–17,500 recorded cows or 39–48% of the available *recorded AI population* would be required.

It should be noted that the issue is complicated by cross-border movement of semen. It is known that a substantial amount of progeny test semen licensed in Scotland goes south but a knowledge of the traffic in the other direction is not available but presumably it occurs also.

2. THE IDEAL PROPORTION OF COWS TO BE PUT TO TESTING BULLS

There is no general answer to the proposition as to 'the ideal proportion' even for a given breed. Where the number of available animals in an AI system is known, it is possible to work out a theoretical proportion. The proportion will vary according to the size of the population, the efficiency of bull sire and bull mother selection, the accuracy required in the test, the selection intensity required amongst the tested bulls or the number of bulls required to be selected from each test to maintain a viable service and, of course, the costs of the scheme in comparison with the benefits. In the numerically smaller breeds, there is a good case for using virtually all the cows to progeny test young bulls provided that there is sufficient discipline within the breed to ensure that only, say, the best two or three sires are used to breed the next generation of bulls.

3. SHOULD MORE BULLS BE TESTED AND ARE MORE RECORDED COWS NEEDED TO TEST THEM?

Whilst a theoretical answer to the first part of the question can be obtained from calculations which take into account the factors mentioned in the previous section it is, perhaps, more helpful to consider it in a more practical way in the light of, for example, MMB experience and then to summarise the comments by the various organisations.

Table 4 shows the number of young bulls which should be tested each year to permit various selection intensities amongst the bulls after test. Table 4 is based on the assumptions a) that Friesian-Holstein bulls in the MMB stud have an active life of 4 years, b) that 67 proven bulls are required to meet the insemination demand and therefore c) that 17 replacement bulls would be required each year. The situation is not quite so clear with the numerically smaller breeds where a lifetime standard collection figure of 15 000 doses per bull has been set in order to minimise inbreeding. However, with the semen used over a 2-year period a proven bull stud of 4–6 bulls per breed is required each year with a replacement rate of 2–3 bulls per annum.

Table 4

Selection Intensity	Required number of bulls to be tested			
	Friesian-Holstein	Ayrshire	Jersey	Guernsey
1 out of 4	67	8–12	8–12	8–12
1 out of 8	136	16–24	16–24	16–24
1 out of 12	204	24–36	24–36	24–36

The conclusion that must be drawn from the information in Tables 3 and 5 is that the current test cow population and number of young bulls tested in the Friesian-Holstein breed is more than sufficient to allow the selection of bulls at a higher level than currently achieved. (In other words it implies that the England and Wales programme has other inefficiencies than that due to a possible shortage of recorded cows).

In the numerically smaller breeds an improvement in selection above the 1 out of 4 tested level requires the testing of more young bulls and therefore an increase in the proportion of cows mated to young bulls; the current levels lie between 10 and 20 per cent of recorded cows.

Comments

(a) The SMMB agree the general concept above but point out the need to shorten the odds by careful selection of bulls to enter a proving scheme in view of the high costs of progeny testing and add that careful selection is probably as important as the question of whether more cows are needed.

(b) AAIC consider there is no evidence that at present the number of recorded cows is insufficient for progeny tested purposes and no good evidence that genetic progress would be increased by progeny testing more young bulls if less rigid selection were also practised. They consider the new regulations will lead to the use of more young bulls (presumably through AI) and this might lead to a shortage of recorded cows. (In paper CAIC 79/21T the Working Group pointed out that an increase in the number of recorded cows could increase the number, but not necessarily the proportion, of matings to young bulls. It added that if the number of matings to young bulls remained constant but bulls move from the natural service sector to the '500 straw' approval category, then the effect would be that the initial tests of such bulls would be more accurate than on average by natural service, although the number of bulls tested would be less. Such an event would not lead, necessarily, to an increased or a decreased rate of genetic progress.)

(c) The NCBA anticipates there could be an increase in the demand for progeny testing resources because more bulls will be tested but it points out that one of the present inefficiencies is the high percentage of heifer records lost because no authentic record of sire/dam is maintained.

(d) Both the NFU and FUW emphasise the need for adequate testing, i.e. accurate and over many herds, of bulls for all the traits of economic importance which are genetically determined. The FUW is satisfied that a sufficient number of bulls is being tested annually but more recorded cows are needed to test these bulls accurately and widely. The NFU mentions the need for objective information on the value of beef calves produced in the dairy herd.

A point of concern mentioned earlier in Committee and also in replies, is that if a number of bulls are imported in the future and these use British testing facilities then this could limit the progress from the testing and selection of home-bred bulls. Great Britain has a high level of AI use and it may be an attractive market for bull owners in other EEC countries and North America who are keen to obtain proofs within Great Britain. If this occurs then it is considered essential to ensure that only semen from superior bulls will be available for widespread use here.

4. WHY FARMERS CHOSE NOT TO PARTICIPATE IN PROGENY TESTING

The same general views were expressed by all the organisations that commented.

(a) The worth of proven bulls has been widely publicised and many farmers prefer, understandably, to use such bulls rather than take something of a risk with young bulls and perhaps end up with a mixed group of cattle. Nevertheless, some of the young sires from outstanding parents are better prospects than some progeny tested sires currently in use.

(b) Pedigree breeders carry out their own breeding programmes and are reluctant to use 'unknown' bulls except on the 'bottom end' of their herds.

(c) Some of the organisational requirements of, for example, DPTS do exclude small herds from participation anyway.

Members of the AI Organisation and the NFU question the wisdom of increasing the number of recorded cows merely to increase the progeny testing capacity. It is more important that those who take part in official recording do so because they are convinced of its value for management purposes and are, therefore, convinced of the accuracy and authenticity of official recording.

Some organisations suggest that there is room for the exercise of a slightly greater degree of persuasion that farmers should contribute to progeny testing so as to ensure that proven bulls continue to be available in the future.

The FUW states that the high cost of official recording is considered to be a disincentive to participation and that the present incentives are inadequate compensation for this.

5. THE INCENTIVES REQUIRED TO PROVIDE MORE RECORDED COWS

As mentioned earlier some organisations question the need to provide more recorded cows. Indeed, the NFU states that it is not clear that there would be an advantage in reducing the cost of milk recording in order to encourage greater participation. Free recording could be counter-productive if it did not provide accurate records. In any case the extra cost of incentives must be measured against the extra benefits that might accrue to the whole industry.

Different forms of incentives have been tried in various countries but not all have been successful. The FUW and NCBA, however, feel that financial incentives are the most attractive ones; the former considers the present DPTS incentives are insufficient. It suggests that male calves as well as heifers should qualify for the DPTS bonus at identification of the calf, a further bonus should be paid when the heifer reaches two years of age, that sufficient semen which is otherwise in short supply should be reserved for DPTS members free of storage charges and that inseminators might receive a bonus for the sale of semen from unproven bulls. The NCBA suggests that incentives could be provided by establishing a fund financed by a premium charged on first insemination certificates. ABRO suggests that a variety of incentives are possible ranging from direct payment for progeny records to no payment but merely involvement in a co-operative improvement plan.

6. THE CAUSES OF THE LOSS OF HEIFER RECORDS

Table 5 shows the breakdown of losses of Friesian-Holstein heifer records; the main source of the information is an analysis of all lactations completed in NMR herds in the recording year 1976/77 (England and Wales).

Table 5 Friesian-Holstein records: breakdown of losses

	Number	Percent of total
1. Total heifer records (heifers completing lactations 1976/77)	217,006	
2. *Losses*		
Sold, Dead, Ceased Recording	22,123	10.2
Missing Information (Date of birth, parentage details)	60,023	27.7
Heifers outside the 22–38 month age range	4,688	2.2
Included in ICC (1–2)	130,172	59.9

Thus only 60% of heifer records contribute to sire evaluation. The greatest individual loss is that of heifers with missing information (28%); these heifers have an unknown date of birth and in the majority of cases will have unknown parentage. A scrutiny of a batch of basic ancestry documents used in NMR showed that 36% of non-pedigree animals had unknown parentage; this figure agrees well with that given in the table.

Scottish figures show that only 65% of heifers noted as being by young bulls as calves do themselves eventually calve. Most losses are by death, usually early on, by being sold fat or by being sold in calf (some of this latter group may be picked up in other recorded herds). Once calved, the loss rate experienced in Scotland is 10–15% and is due to sale, death, resignation from recording and outside the ICC range. (Note that the 10–15% is not comparable with the 40% total from Table 5 because the former refers to progeny test herd records whilst the latter refers to all records.)

Comments from other organisations suggested the same reasons as those given above for the loss in records but these organisations could not be expected to quantify the losses.

Other comments made were:

(a) Whether milk recorders need a better understanding of the value of obtaining the correct information and whether there is a case for a greater investment in manpower for identification work (NFU).

(b) Producers might prefer to retain daughters from their best cows and to cull daughters of DPTS bulls which, it was suggested, are out of the poorer cows (NFU + FUW).

(c) Economic pressures may require heifers to be sold before they complete their lactations (FUW).

(d) The rules of DPTS may also be responsible in part. If less than 50% of the original number of daughters are retained then the bonus is not payable and the records of those retained in the herd may not be recovered (FUW).

(e) The losses due to lack of identity would be greatly helped by the introduction of a national identification scheme which now seems technically feasible and should be promoted (ABRO).

Printed in the UK for HMSO
Dd 737753 C8 6/84